MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 8 JUNE, 1935 Number 1

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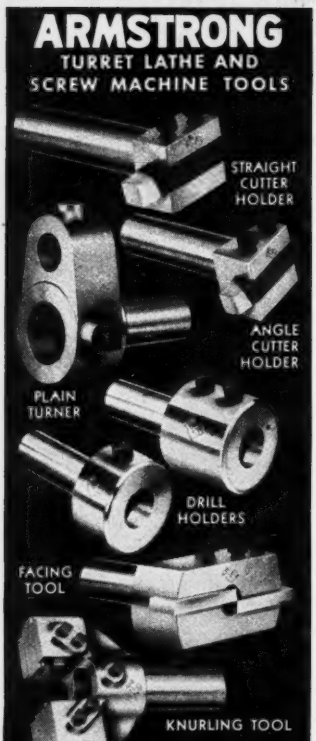

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CINCINNATI, OHIO JUNE, 1935 VOL. 8, NO. 1

E Engineering
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Building Motors for Pennsylvania's Streamlined Locomotives

The electric locomotive is assuming a position of importance in the railway industry. In this article the author describes some of the operations in the building of these powerful engines.

BY HOWARD CAMPBELL

MANY special machining methods are employed in the construction of twin type motors for driving the new streamline locomotives for the Pennsylvania Railroad. Each locomotive will be equipped with six twin motors developing 4,620 horsepower. Designed for operation on the main line of the Pennsylvania between New York and Washington, D. C., they are completely streamlined and capable of hauling trains of full

Fig. 1—Welding twin motor frames for the Pennsylvania Railroad's new electric locomotives.

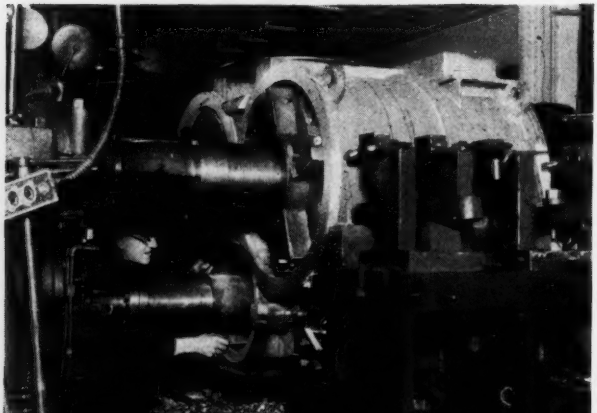

Fig. 2—Boring two stato fits and the axle fit in "twin" motor frame fo an electric locomotive.

size and weight at a speed of 90 miles an hour.

Fifty-seven of these locomotives are now under construction for which motors to drive a large number of them are being built at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company. Together with others now in service they will make a total of 191 single phase electric locomotives on lines carrying the world's densest traffic. An appreciation of the extent of the traffic may be gained from the fact that electrification will embrace 686 daily time table passenger and freight trains covering a total of more than 34,700 miles each 24 hours.

The term "twin motor" is derived from the fact that two motors are combined as a single power unit, driving the wheels by means of a quill inside of which the axle revolves. The motors are mounted on the locomotive as sprung weight, the specially-designed quills compensating for all the relative motion between the axle and the locomotive. Some of the more interesting operations in the construction of the motor will be described in this article.

In order to proces the motors in th most efficient man ner, an operatio layout was create to handle productio according to th modern "straigh line" method. Th motor frames ar made from standar steel plate, cut to rectangular shap and then rolled to form a cylinder the required size. When shaped, the are arc welded, forming a solid cy inder. The welding is developed as far as possible on each barrel befor welding two frames together to for the "twin" construction, due to th fact that the simple cylindrical shap simplifies the welding procedure.

After being welded, the frames ar annealed and shot blasted. The fe are then planed and drilled, and th quill cap is planed, drilled, and as sembled, all of which are compara tively simple operations. The ne operation, however, which is that boring the twin-frame, is more in teresting. This operation is shown process in Fig. 2.

The machine used for the operatio is a horizontal boring machine of spe cial 3-spindle design. The two upp bars are used to bore the stator fits the two frames and the lower ba machines the axle fit. Two cuts ar taken through each bore, 1/32 inc being left in the roughing operatio for removal by the finishing tool.

Fig. 4—When assembled, the armature is ground to size and perfect concentricity in this Landis grinding machine.

Each of the stator frames is bored to 31.448 inches with a minus allowance of 0.002 inch, and the axle fit is bored to 16.500 inches with a plus allowance of 0.004 inch. The mechanic shown in the illustration is in the act of gaging the axle fit to find whether or not the tool is correctly set. Considering the size of the frame, a close degree of accuracy is required. The faces of each frame are also finished in this machine, a special tool being used which finishes the face in a single cut. Two of these twin-frames are finished in 24 hours on this operation.

Before the stator laminations are assembled to the frames, each of the two barrels is slotted in a vertical shaper so that the laminations can be positioned by means of keys. The laminations are then stacked in the stator and bored to assure perfect concentricity with the armature shaft, also to provide an air gap of exactly the right width to insure proper motor characteristics. To bore the laminations, the frame is clamped to the carriage of the machine shown in Fig 3, which

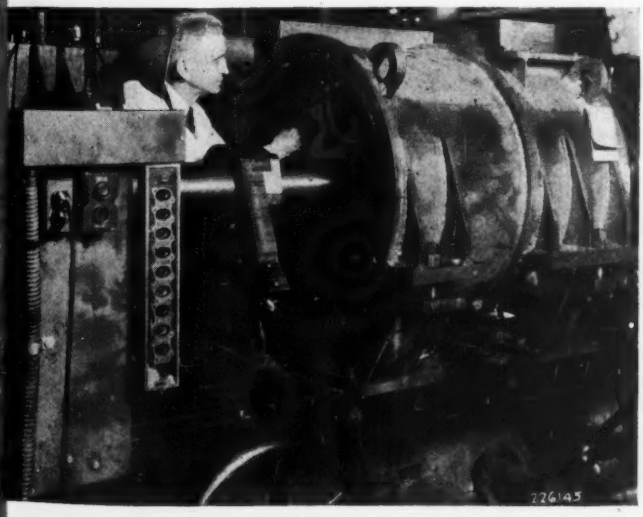

Fig. 3 — Setting the tool to bore out the stator iron. By reinforcing the iron with hardwood strips, the iron can be bored out without difficulty.

Fig. 5—Undercutting the mica insulation on a motor commutator.

is a horizontal 2-spindle machine built in the Westinghouse plant. Proper positioning is assured by lining up the frames with a fixture made to fit, exactly, the finished quill bore.

Stator laminations are however, punched from comparatively thin sheet metal, and, due to the requirements of design, are somewhat fragile even when packed into a motor frame. The iron is reinforced with hardwood strips, made to fit the apertures in the iron and extending entirely through the frame, giving support to the lamination tips while boring. Although the job of wedging the strips takes some time, once the strips are in position, the boring operation can be finished with neatness and despatch.

Approximately 3/32 inch is removed from the bore of the assembled stator, the wood strips being bored with the stator iron. As receive in this department, the hole in th stator punching is 23.000 inch, plu or minus 0.003 inch. In the borin operation this opening is enlarged t 23.200, with a plus tolerance of 0.00 inch. The frame is then ready to b sent to the assembly department fo winding and assembly.

The punchings stamped from th center of the stator laminations a utilized in the armature of the moto being assembled to the shaft an spider with the rear end plate welde to the spider. When assembled, th rotor is placed between the cente of the Landis grinder shown in Fig. and ground to perfect cylindricity a size. Approximately 0.020 inch stock is removed in this operatio the diameter of the armature bein held to within 0.002 inch of the spec fied size.

Figure 5 shows the operation under-cutting the mica on a comm tator. Each copper segment is co pletely insulated from the others mica, yet the insulation must be ke below the surface of the copper

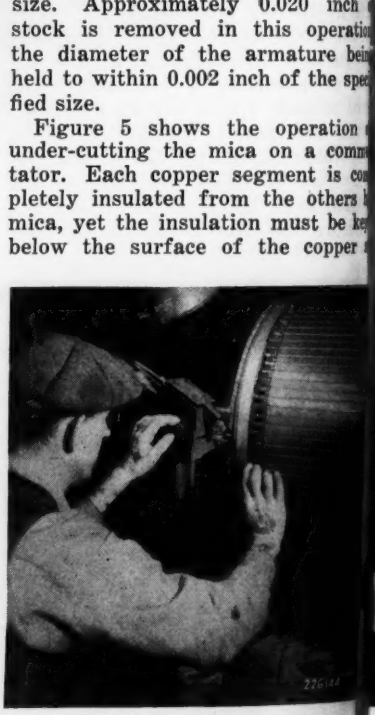

Fig. 6—Brazing connectors to the ends armature coils with silver solder. An elec welding machine does this job quickly economically.

that the brushes will not strike it as the armature revolves. The cutter is approximately 1 inch in diameter and 0.025 inch thick. A machine of special Westinghouse design is used for this operation.

The operation shown in process in Fig. 6 is that of brazing connectors to the coils on the end of the armature. This operation is performed after the armature is wound and the commutator assembled. A flat, thin piece of silver solder is doubled and slipped over the coil end, between the coil end and the connector. With the connector in place, the two jaws of the welding machine are closed over the connector and current is applied, fusing silver solder and thus joining the connector to the coil end.

Before the armature is assembled to the motor frame, it is required to pass certain exacting tests for dynamic balance. If the armature is out of balance, the unbalance must be compensated so that the armature will operate smoothly at all speeds. Applying a counterbalance to compensate the unbalance is simple enough; the real task is to find the exact point of unbalance—which may be any distance from the axis and at any point between the ends of the armature. The machine for discovering the point and amount of unbalance is shown in Fig. 7.

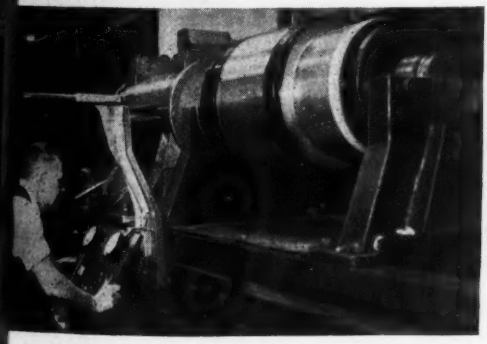

Fig. 7—Each stator is dynamically balanced to insure proper operation in service.

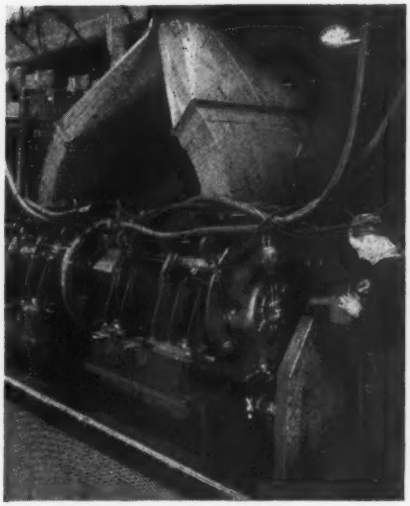

Fig. 8—Putting the completed motors through the final test. One motor drives the other, then the procedure is reversed.

With the armature in position in the machine and coupled up so that it can be rotated at any desired speed, power is applied. One end of the shaft is held in a bearing in a movable fulcrum which is anchored so that it cannot vibrate. The other end rests in a bearing which is so held that it can vibrate as centrifugal force is exerted by the unbalanced condition of the armature while rotating at high speeds. The rotating speed of the armature is controlled until the critical speed of the mass, which includes both armature and rotating counterbalance weights, is reached.

Using this speed of greatest off-balance vibration, a rotating system of counterbalance weights is set in

(Continued on Page 32)

Inter-Departmental Transportation at the Brown & Sharpe Plant

By Francis A. Westbrook, M.E.

DURING the century that the Brown & Sharpe Manufacturing Company of Providence, R. I. has been in existence, the plant has grown from the one small building in which it was started to an industry that requires 10 large buildings, covering some 32 acres of ground. In these 10 buildings are manufactured engine and turret lathes, automatic screw machines, milling machines, dividing heads and other machine accessories, machinists' small tools, cutters of various kinds, a considerable line of textile machinery, and other manufacturing equipment.

The material-despatching and transporting methods described in this article are not only efficient and economical but have the advantage of being adaptable to any large plant.

It is obvious that when the plant is operating at anything like normal, the amount of material in process must be great indeed and a thoroughly efficient method of despatching and transferring the parts from one operation to another is imperative. At times there have been as many as 30,000 jobs in process, and although not all of the jobs have to be moved every day, within recent weeks there have been 967 jobs moved from one department to another in a single day. The surprising part of this fact is that these jobs were handled by 12 men, and this demonstrates what c be accomplished through efficient o ganization.

Before the internal transportati system was brought to its pres high state of efficiency, the un method of procedu called for a depar ment helper to mo each lot of work the next departme as soon as the oper tions called for his own departme were finished. T result was that n only was it a diffic matter to keep tra of the material process, but a gre deal of time w wasted and at time the elevators wer so crowded that something had to b done to relieve the congestion.

Men were traveling back and fort with trucks only partly loaded, dou ling the amount of traveling actual required and crowding the aisles a elevators to such an extent that became a question of installing mor elevators, for which it would be ha to find space, or organizing intern transportation methods on a mor systematic basis.

In view of the above facts, carefu studies were made and it was foun that the internal movement of mate ials in process of manufacture co

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MATERIAL C - 1 CORE PATT. SYMB. B 108
HUB DIAMETER B F HUB LENGTH B F ORD. NO. 40060 DATE 3 - 4 - 35
ALLOT. B12 - 112 - 9
PART Table pin - B4482

PIECES SENT ALONG	DATE REC'D	DATE DUE	OPERATION	MCH. RUN	BLDG. AND FLOOR	CODE	LOAD	OPER. NO.	UNIT HOURS EACH	SET UP	PIECES SPOIL-ED
		3-12	Castings ord.		Fdry			1			
13	3-27	3-26	Snag		10-1			2			
			(Do not paint)								
12	3-28	3-29	Mill		4-2			3			1
12		4-3	Insp.		4-1			4			
		4-8	Store room		4-1						

Fig. 1—A route sheet similar to the one shown above accompanies each lot of material th enters the manufacturing department.

be accomplished without additional elevators, and at a considerable reduction in cost. The suggested changes were adopted, resulting in relieving the congestion, a more systematic method of controlling production, a reduction in the number of trucks required, and a corresponding reduction in the cost of non-productive labor.

The position of General Foreman of Transportation was created, and the entire matter of material transportation was turned over to him. Transfer stations were established on each floor of each building as close as practicable to the elevators. More than one such station was necessary in some instances, depending upon the work being done and the number of departments on the floor. Eight of the buildings have one transfer man each, the other two each requiring two transfer men. These transfer men do nothing but move materials from one point to another according to a well-planned system.

Each lot of parts that enters the shop is accompanied by a "rou sheet" which travels with the job the way through the plant. This rou sheet is made out by the schedulin department, is sent to the roug stock stores with the order for th stock, and enters the finished store department with the finished piece from which it is returned to the sched uling department. The route shee bears the sequence of operations fo the part, so that when an operatio has been finished in one departme the foreman or transfer man can te at once where the job is to be take for the next operation. A route shee filled in as for a regular job, is show in Fig. 1.

Assuming that the milling opera tion in building No. 4, floor 2, ha been completed, the foreman of th department makes out a job transfe slip, as shown in Fig. 2, indicatin that the work is to be transferred t the inspection department in buildin 4, floor 1. The department helper the moves the work, properly ticketed, t the transfer station associated wit

his department.

When the transfer man arrives at this station on his rounds, he can tell by a glance at the transfer ticket where the job is to be taken. When the transfer has been made, he takes up the ticket and turns it in at the transportation department office, which, in turn, delivers it to the scheduling department. Thus the scheduling department is able to follow the movement of each lot of material and duplicate the moves on a planning board, providing a visual record by which anyone can determine at a glance the location of any special lot of parts.

831 S

JOB TRANSFER SLIP

QUAN. FOR'D	TIME NO. SYMBOL OR SHEET NO.	LOT	DESTINATION
12	B4482-7	7	4-1

DATE 3-10 19 35 SUB-FOREMAN Jones

Fig. 2—This ticket indicates that the job is ready to be moved to the next operation.

The transfer men who are permanently located in each building make their rounds to the transfer stations at certain specified times during the day. If there is a full load for a certain department, they deliver the load direct to the transfer station connected with the department indicated on the ticket. The work is then picked up by helpers in that department and placed at the machine allotted to the operation indicated on the route sheet. Very large lots, however, are usually delivered direct to the machines by the transfer men in order to save handling.

If only a partial load is involved, it is taken by the transfer man to the elevator, where he leaves it. It is then taken by the elevator man to the proper floor, where he puts it off. When the transfer man comes along on his next trip he will move the job over to the transfer station which, as was stated before, is as near to the elevator as possible.

If a partial load is to be moved across a bridge into another building, the elevator man puts it off at the bridge floor and when a transfer man from any building who may be going in that direction sees it, he takes it along with him. All transfer men and truckers are instructed to this effect, the plan being that they shall not move empty-handed any more than is absolutely necessary. As

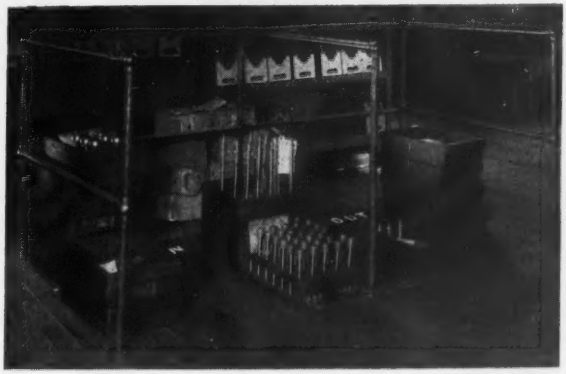
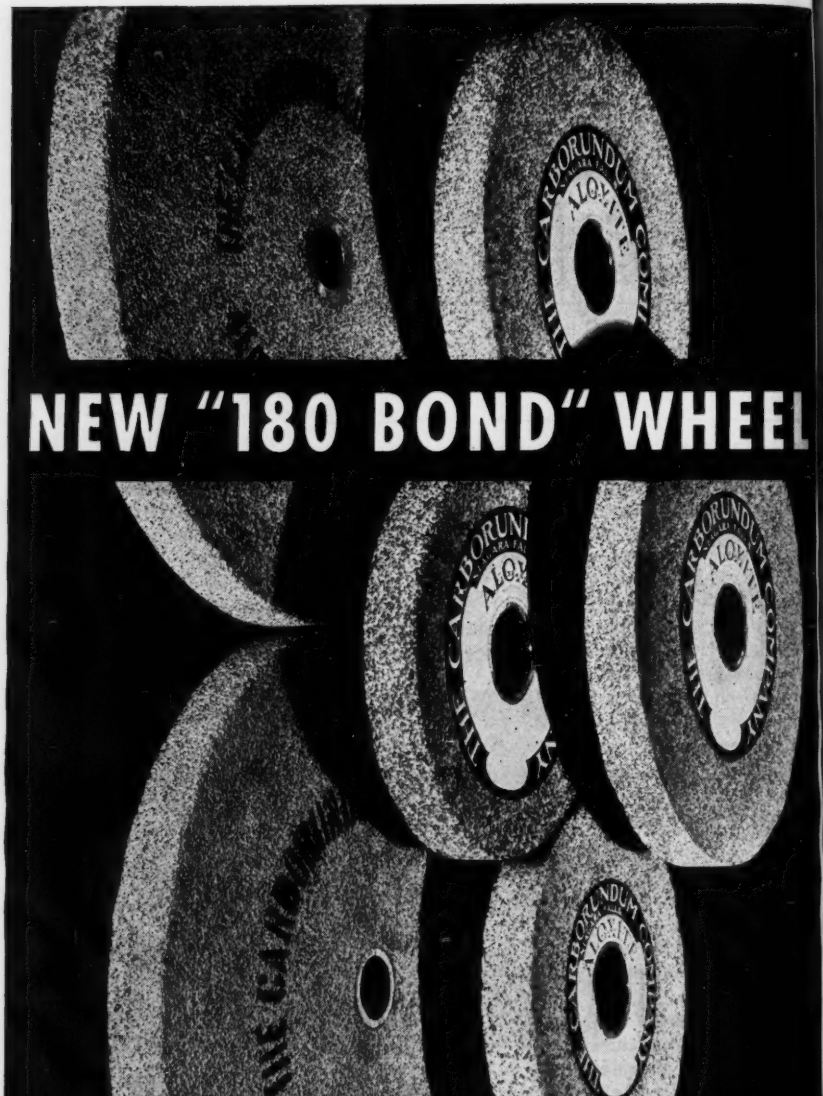


Fig. 3—Typical transfer station. Note that one section is labeled "Out" and the other "In" for outgoing and incoming materials.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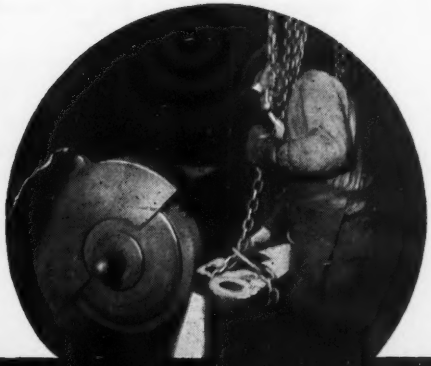

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Fig. 4—Type of electric truck used.

castings from the foundry to various departments for machining and from there to the erecting departments. Parts that are not too heavy are moved on skid platforms, carried on hand lift trucks. Some of the regular transfer men use hand lift trucks part of the time, but cannot do all of this class of work, consequently most of the transferring of heavy parts is controlled from the transportation department office. When a foreman needs either a hand lift truck or an electric truck, he sends a slip to the transportation office by the regular plant communication service. If he is in a hurry, he makes the request by telephone.

a result of this procedure, the time spent in traveling has been cut down considerably.

Where rush jobs are concerned, however, the plan is modified. Route sheets and instruction sheets for rush jobs are enclosed in green envelopes, the green envelope indicating to anyone who sees it that the job to which it is attached has a "clear track" or right of way over the ordinary production jobs. Whenever a transfer man gets a transfer slip for a job bearing a green envelope, he is instructed to deliver it to the next operation at once, regardless of whether or not he has a full load.

Thus far this article has dealt only with the lighter materials which do not call for mechanical handling. Heavy parts are, of course, moved by the use of electric trucks and hand lift trucks, of which there are five each. The electric trucks are used to move

The question of inside plant transportation is not complete by any means without reference to the great variety of racks and carriers used, some of which are shown in the illustrations. Many of the machine parts are not only machined to a high degree of accuracy, but also have a high finish. Such parts must be handled in such manner that they cannot strike against each other or against any other metallic surface.

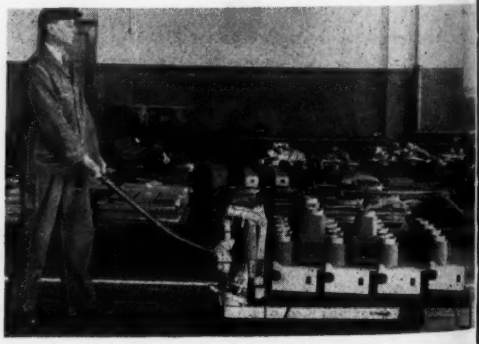

Fig. 5—An efficient hand lift truck, plus the necessary number of skid platforms, provides the answer to most material transportation problems.

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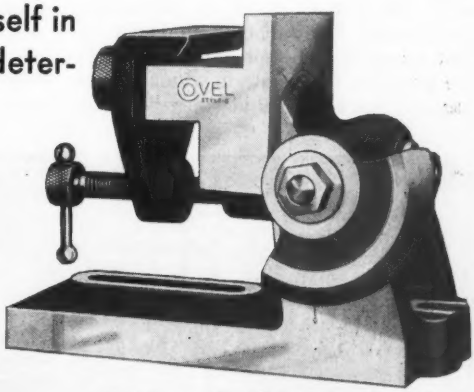

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Frequently precision instruments and their parts are among the materials that must be moved from one part of the plant to another, and it is obvious that they must be guarded so that they cannot roll around or strike against each other. For this reason many kinds of special racks, shelves, and boxes have been designed to hold these parts. Some of the carriers are on wheeled trucks, some are permanently located on skid platforms, and others are in tote boxes.

Tote boxes are all of standard size, and the trays that are used with them, although of different designs to hold different kinds of parts, are of standard size to fit the boxes. Some of the trays, for instance, have holes in them so that arbors may be set upright. Others are provided with slots in which shafts can be placed so that they will be segregated from each other. No metal is used in making the trays, thus polished surfaces cannot become scratched or marred.

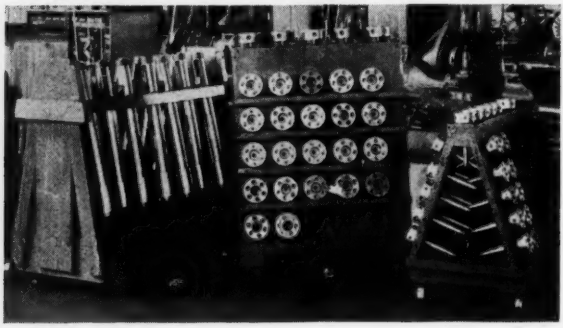

Fig. 6—Special racks on wheels for carrying shafts and other highly-finished machine tool parts.

The same idea has been carried out in the manufacture of the larger boxes that are mounted on wheels, as well as for other material carriers. Many of these special carriers are designed by the transportation department. When a new part or product is placed in production, a sample piece is sent to the general foreman of this department and he decides what type of carrier shall be used for it and whether or not any of the existing types of carriers can be used. If necessary, he asks the engineering department to design a new carrier of the type desired.

Fig. 7—Such parts as spindles are carried in these "boxes on wheels."

Probably the largest item in non-productive labor costs in the average manufacturing plant — and the most uncertain—is the item for material handling. Plants that are engaged in the manufacture of a standardized product can be laid out and equipped with automatic conveyors in such manner that most of this item can be eliminated. It is not so easy in a plant where the list of products covers a wide range, such as the Brown & Sharpe plant, but

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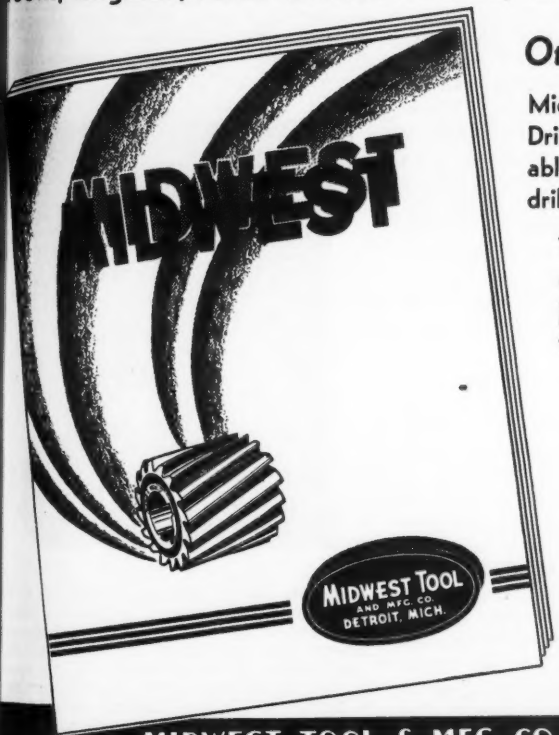

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the methods described in this article are both simple and efficient and have the advantage of being adaptable to almost any plant of any size.

Building Motors for Pennsylvania's Streamlined Locomotives

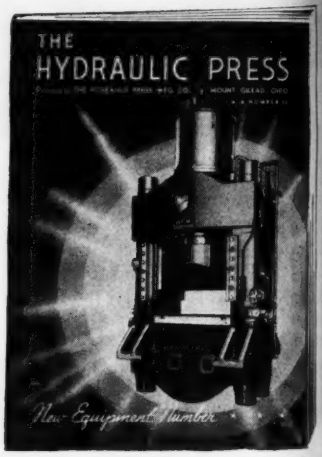
(Continued from Page 21)

motion under the control of the operator, the mechanism of the machine being such that the weights can be adjusted while in motion. These weights are adjusted by the operator until the rotating mass appears to be in balance. By means of suitable instruments, readings indicating the amount of correction required for the vibrating end of the armature are taken. Moving the fulcrum to the opposite balance point on the armature and repeating the operation completes the task.

After the balanced armatures have been assembled in the frame with the quill, brackets, and gears in place and the electrical connections completed, each twin motor is given a complete test as shown in Fig. 8. In this test two "twin" motors are mechanically hooked up together and each is used to drive the other while the test is being made. One drives the other during the first part of the test and the procedure is reversed for the latter part. Records are made of all instrument readings so that a complete "history" of each motor can be kept on file. Forced ventilation as in service is necessary, during the test, to dissipate the heat that is generated. When this test is completed, the motors are ready for service on the streamlined electric locomotives.

All parts of the motors are carefully built and the dimensions are held to close tolerances so that all parts will be readily interchangeable. Service and dependability are the k notes in the construction of the m tive power for this great electrific tion project.

HYDRAULIC PRESS MAGAZINE. monthly publication by this name, de ing with the uses of modern hydrau machines in metal-working, is now be published by The Hydraulic Press Ma Co., Mount Gilead, Ohio. According the publisher's statement, this magaz will aid manufacturing executives control their press production costs a will describe methods now in use various plants whereby manufactur



costs are being reduced from 35 to per cent by the use of hydraulic pow The magazine will discuss installatio where the flexibility of the hydrau mechanism is combined with the spe of the mechanical press, making possib a degree of control that is said to pr vide the utmost in press operation.

The Hydraulic Press Magazine will sent regularly and without charge manufacturing executives and engine who send a request to the firm me tioned above.

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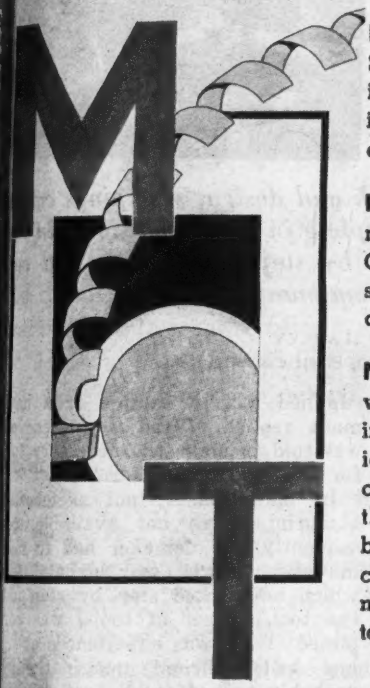

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Punch Press Operations and Tools, IX

Within certain limitations of stock and design, stampings can b blanked, pierced, and drawn complete in one operation. In th article the author explains, step by step, the design and co struction of a compound die.

By C. L. Szalanczy
Die designer, Westinghouse Electric & Mfg. Co.

THE development of the stamping method of producing metal parts has been gradual, but continuous. Thirty years ago nothing more complicated than the punching of a few holes or the forming of a comparatively simple piece of work was attempted; today whole sections of automobile bodies are produced complete at one stroke of the press, the section being blanked, drawn, and pierced, if necessary, in a single operation.

The possibilities of the operation are limited only by the inventiveness of the die designers and builders, but in past years this fact retarded the development of the stamping industry considerably. Previous to the past decade the diemaker was, in most cases, also the die designer, and the production possibilities of a die depended entirely upon the skill and imagination of the person to whom the job of building it was allotted. When a set of punch press tools was required, the diemaker was usually supplied with a sample or a ha made replica of the work-piece was told to make the necessary to for the job from the sample.

In many cases tool sketches blueprints were not available, c sequently the diemaker had to ma his own designs and layouts, fr which he worked step by step u the tool, or set of tools, was co pleted. If he was experienced enou and had sufficient imagination, probably turned out a first-class j If not, the firm spent a lot of mon on a set of tools that were mediocr and probably wasted as much as th saved. At best, the job of producin the dies was slow and, inasmuch each diemaker incorporated his o ideas into the construction of h dies, no two sets of tools were bui alike. This lack of standardizati tended, of course, to increase th cost of press tools.

In the past ten years or so, ho ever, a very noticeable change h taken place. In view of the fact th

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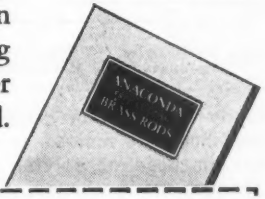

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upon the design of a die may rest the responsibility for meeting cost limitations, or for maintaining a predetermined production schedule, the best thought and experience available are incorporated in the design of the tool and it is worked out on paper to the last detail before the job is turned over to the manufacturing department. The knowledge of espe-

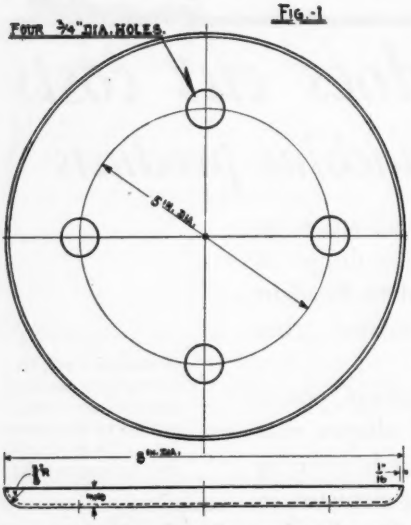

Fig. 1—Drawing of blank produced by the combination die illustrated in Fig. 2.

cially trained tool designers and experienced die makers is combined for the purpose of solving punch press production problems, resulting in tools that are most economical and practical. Die construction is standardized and stock parts are used whenever practicable.

The most important result of careful planning has been the development of dies, termed "compound dies", with which several operations are performed at a single stroke of the press. This ability to turn out a complete stamping at each stroke of the punch press not only reduces the manufacturing costs, but also increases pr duction.

In planning the construction of compound die, the design of the wor piece and the kind and thickness the material to be used must be giv first consideration. The use of a co pound die on materials that are eith too light or too heavy should not attempted. The depth of the dra part should also be considered, as must be deep enough to provide suf cient wall thickness for the efficie operation of the blanking punc which is also the forming die pa This item will be explained mo thoroughly farther on in the artic

The part illustrated by the dra ing Fig. 1 is a fair example of t type of work that is produced the use of a combination die. Th blank is to be 8 inches in diamet and is drawn to form a saucer-li shell 3/8 inch deep, containing fo holes 3/4 inch in diameter and equa spaced on a 5-inch circle. The bla is to be made from 1/16-inch s sheet brass which, under normal co ditions, can be cold drawn, pierce and blanked in a single-action pre without difficulty.

Figure 2 is a drawing of the co bination die with which the pa shown in Fig. 1 is produced. Like t blank, the die and its component par are all round and thus may be ma quickly and at low cost in the lath The die ring A is of high speed ste finish-machined in the lathe, har ened to 80 to 90 points sclerosco and then ground on the top, bott and inside. The die ring cuts out t blank to the developed diamet which is first determined by mea of the "try-out" method.

The bottom shoe B is made of h rolled sheet steel stock. It is surfa ground on both top and bottom a is counterbored 1/8 inch deep to pr vide a seat for the die ring A, shown in the illustration. The d

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ring is positioned by the use of two dowel pins and anchored to the bottom shoe with hexagon head machine bolts.

The blanking punch, indicated at C, is of high speed steel, finished in the lathe to the required size as pre-

pins would necessarily have to smaller in diameter and might be under the pressure to which the are subjected in service. The stripp pins are of stub steel and are al fitted through the bottom shoe B that they will rest on the spring p

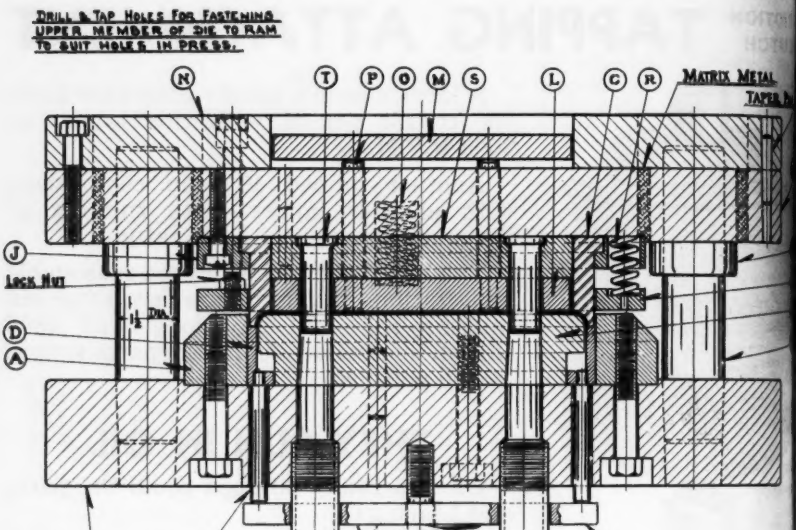


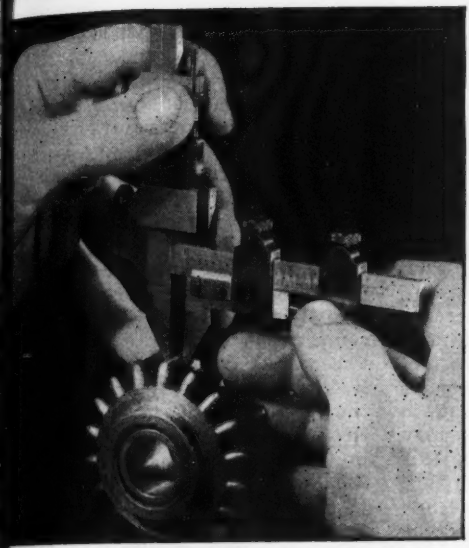
Fig. 2—Cross-section drawing of the combination die that blanks, pierces, and draws the sh metal piece shown in Fig. 1.

determined by subtracting the necessary clearance from the diameter of the die. The punch is bored out so that the blank may be drawn up into it as the upper assembly of the die moves downward by the action of the press, thus forming the blank to shape.

The spring stripper D is of machine steel and is made with an offset shoulder at the bottom, as shown, so as to allow for the six stripper pins E, which are press fitted into it. If this extra stock were not provided at the bottom of the stripper, the

F. The stripper D should be c hardened to withstand wear.

The stripper D also serves as t blank-holder, keeping the blanked d flat while it is being drawn to sha The stripper is actuated by the spri G, which is attached to the under s of the die shoe. The spring exte down through the openings in b the bolster plate and the press b thus it is easily accessible for t die setter and it is an easy mat for him to adjust the spring so t the exact tension required may be o tained. The spring assembly is h



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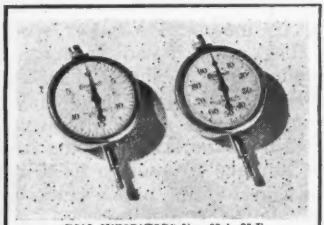

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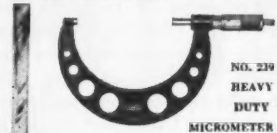

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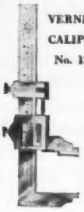

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up by means of a heavy stud.

The spring pad **F** may also be made from a sheet of 1/2-inch hot rolled steel plate, and may be left rough on the sides, although the top on which the stripper pins rest should be surface ground to assure an even setting of the pins. Holes are provided in the pad for the six sections of gas pipe **H** to slide through. A section of pipe is located under each of the clearance holes in the forming punch **I**, which is also the piercing die part of the combination tool. The pipes are threaded into the bottom of the die shoe **B** to serve as channels through which the scrap slugs, made when the holes are punched, may fall. By guiding the slugs in this manner, they are prevented from falling on the top of the spring pad and interfering with the stripping action.

The combination forming punch and piercing die **I** is made from high speed steel and finished to the specified dimensions of the inside of the blank. It is provided with six openings for the punches **T**. A relief is turned on the lower part of the periphery of the punch **I** to provide clearance for the shoulder on the stripper **D** so that the stripper can rise to the top level of the die ring **A** when the die is in the open position with the ram at the top of its stroke. The punch **I** is hardened to 80 to 90 points scleroscope and is anchored to the bottom shoe with hexagon head machine bolts and dowels.

The punch holder plate **J** is made from hot rolled sheet steel, turned and bored to leave a shoulder in the lower half of the bore. This shoulder supports and holds the punch **C** in place, as shown. The plate **J** is set up into the top shoe **K**, to which it is attached by several filister head screws. In removing the stock from the bore of the punch holder plate **J**, care is taken to cut it or burn it out so as to obtain a disc large enough to make the piece **L**. This piece machined to a slip fit in the bore the punch **C** where it serves t double purpose of backing up t blank and as an ejector to strip t blank from within the die after t forming operation has been co pleted.

The ejector **L** is actuated by t knocker **M**, which is made from t center that was cut or burned out the top plate **N**. To further facilita the stripping action, several hea compression springs **O** are placed b tween the stripper and the top sh **K**, the parts being recessed to ho the spring in position, as show Recessing the stripper and top sh in this manner makes it possible use longer springs; thus the spri will last longer and replacements d to breakage will be greatly reduc

The knocker pins **P** are of s steel, turned to a size that will be press fit in holes provided for th in the ejector **L**. These holes countersunk at the lower ends so t the knocker pins can be riveted ov When this is done, the entire botto surface of the ejector is surfa ground so that it will not mar t blanks.

The outside stripper **Q** is of h rolled sheet steel, turned on the ou side and bored to a slip fit on t punch **C**. The function of this strip is to remove the scrap resulting fr the blanking operation from t punch. It is actuated by a series compression springs **R** that are set between the stripper and the top sh clearance holes being provided in t punch holder plate **J** to allow t compression springs to pass throug

The stripper **Q** is held in positi by a number of filister head scre that extend down through the t plate **N**, the clearance holes for t heads being counterbored to a dep that will permit them to move up a down with the stripper. Lock nu

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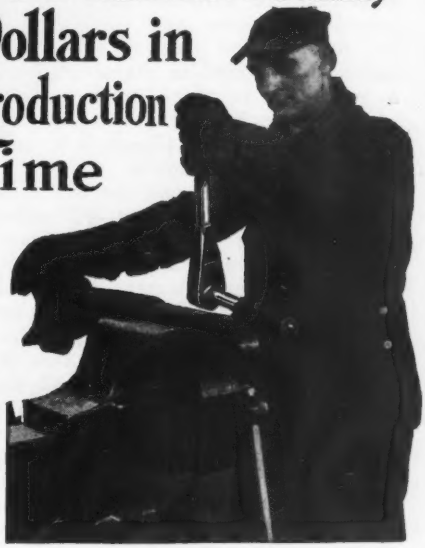

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are usually provided for these screws so that they cannot work loose and allow the stripper to get out of alignment.

The ejector L area is backed up within the punch by the combination backing plate and punch holder S, which serves to hold the punches T in position. This punch holder is made from hot rolled sheet steel and is anchored to the top shoe by means of two dowels and several filister head screws. It is counterbored 1/8 inch deep on the top to provide clearance for the shoulders on the inset punches, the shoulders serving to prevent the punches from being pulled out in the punching operation.

The punches T are of high speed steel and are hardened to 85 to 90 points scleroscope and then ground to the specified size. When these punches are small in diameter, it is a good idea to make up a number of extra punches for use in case of breakage so that no time will be lost waiting for replacements.

The top plate N and the top shoe K may both be made from hot rolled steel, surface ground on top and bottom. These plates are fastened together with hexagon head bolts and are kept from moving or shifting by the use of either dowels or taper pins of the correct size. The top shoe K carries the forming punch C and, inasmuch as extreme accuracy is absolutely essential in these dies, the two parts must be maintained in perfect alignment. In view of this fact, four guide pins are usually used instead of the customary two employed on other types of dies.

The four guide pins are located in the bottom shoe and should not be less than 1½ inches in diameter, with a standard taper machined on the bottom end. This taper locates the guide pin in the bottom shoe and provides for fast assembling, since the pin is simply pressed into place. The four bushings for the guide pi are located in the top shoe, where th can be anchored, efficiently a cheaply, by the use of Matrix Meta

It will be observed that the combi ation type of die does not have a pun holder stem. In order to provide i anchoring the die properly, holes a drilled and tapped in the upper sh to match the existing holes in t press ram.

"COMPLETE INFORMATION ON T PROFITABLE USE OF CARBOL TOOLS"—a new thirty-six page book now being issued by Carboloy Compa Inc., 2975 East Jefferson Avenue, Detro Michigan—should be of interest to b present users and prospective users cemented carbides.

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The above general information is sup plemented by 10 pages showing in illu trated form the complete manufacturi process of Carboloy cemented carbi from the raw tungsten ore through the finished tools. This section gene ously illustrates several phases of th manufacturing process which have ne before been published in detail.

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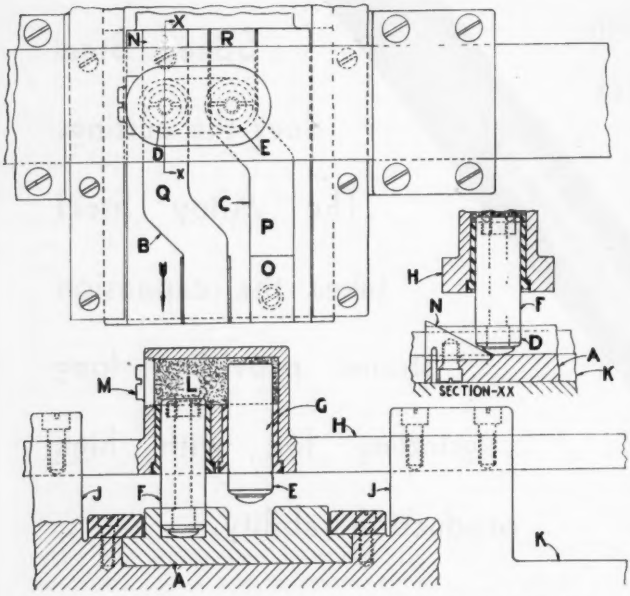
Hydraulic Mechanism For Successively Engaging Follower Rolls in a Double-Track Cam

By J. E. Fenno

A DOUBLE-TRACK reciprocating cam is used in a wire forming machine for imparting the forward and return movements of a slide, the latter dwelling at each point of reversal. The forward and return movements occur at different points in the cam's travel. The two cam tracks were therefore designed with path contours corresponding to these movements and provision was made for engaging the tracks alternately at the ends of the stroke. To provide this engagement, the slide is equipped with two follower rolls, their alternate engagement with the cam tracks being accomplished hydraulically.



Drawing of Hydraulic Mechanism for Successively Engaging Follower Rolls in a Double-Track Cam

This unique mechanism is shown in the illustration. The sliding cam is indicated at A and is reciprocated at a uniform velocity by a member (not shown) of the machine. The cam grooves in which the follower rolls D and E engage are shown at B and C. The rolls are free to turn on shoulder screws in the plungers F and G respectively. Both plungers are hardened and ground and slide in hardened and ground bushings in the slide H. This slide is supported in guides J cast on the machine frame K.

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an extremely heavy grease deposited through the hole closed by the retaining plug **M**. In one end of each cam groove are secured the inclined blocks **N** and **O**, a side view of block **N** being shown in the sectional view **X-X**. These blocks, together with the hydraulic arrangement, serve to shift the rolls alternately at each end of the slide stroke; that is, one roll is forced upward by the block in the one groove causing its plunger to enter chamber **L** and displace the grease so that the other plunger is forced downward until its roll engages the other groove.

In the position indicated, the slide **A** is traveling in the direction of the arrow and as the part of the groove in which the roll **D** is engaged is parallel to the line of motion of the cam, the slide **H** dwells. As the cam continues its movement, the rounded head of the shoulder screw in which the roll turns comes into contact with the angular part of the block **N**, causing roll **D** to rise and leave its groove. This, as already explained, causes the displaced grease to force roll **E** into its groove.

At this point, the cam reverses its motion and roll **E** travels along the straight portion of the groove at **R**, causing the slide **H** to continue its dwell. When the roll reaches the angular portion of the groove, the slide is carried rapidly toward the right and dwells again when the roll passes into the parallel part of the groove at **P**.

The roll continues along this part of the groove until the rounded head of the shoulder screw in which the roll turns engages the block **O**. This block then forces the roll up out of the groove and causes the roll **D** to descend by means of the hydraulic action into groove **B**. The cam then reverses its movement and the dwell of slide **H** is continued here until the roll engages the angular portion of the groove at which time the slide is returned rapidly to the position shown. Continuing the movement of the cam, the latter carries the roll into the parallel position of the groove at **Q**, causing the slide to dwell. This completes one cycle of the cam movement.

Graduating a Shrink Rule

By Charles Kugler

SOME time ago the writer was called upon to make some experimental patterns from a special metal the shrinkage factor of which

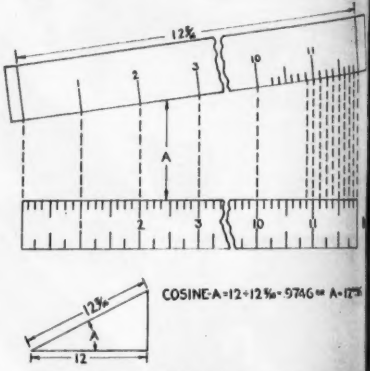

Illustration of Method of Graduating a Shrink Rule

was 5/16 inch to the foot. The first requirement was, of course, a shrink rule with a corresponding shrinkage factor. Not being able to obtain such a rule, I made one by the following method.

On a drawing board I placed a standard steel rule, indicated at **B** in the drawing, in a horizontal position. Above it I placed a strip of blue steel, **C**, arranged at the correct angle to provide an additional 5/16 inch on the angle to correspond to an even 12 inches on the horizontal. The angle is easily calculated as shown at **A** in the illustration.

With the rules in position, it was

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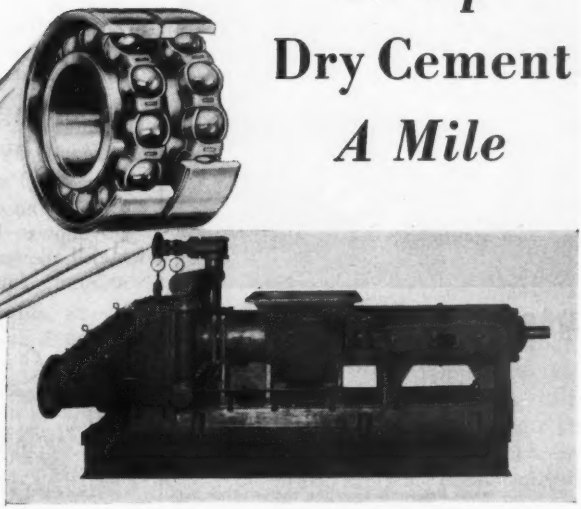

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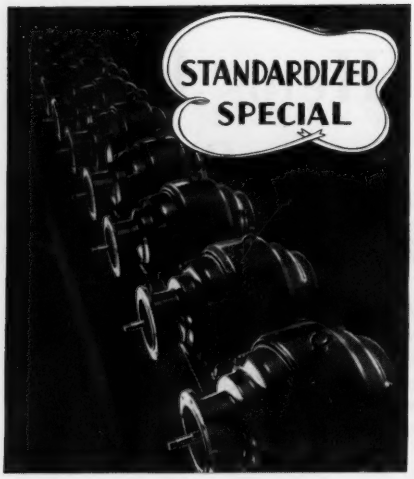

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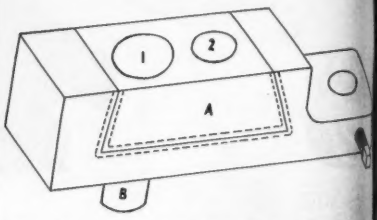
only necessary to transfer the gradu-ations from the 12-inch scale to the improvised scale, using a triangle so that the lines would be exactly even. After the edge of the shrink scale had been marked for the graduations the graduations were marked off and etched in by the usual wax-and-acid process. The accuracy obtained was sufficient for pattern work.

Repairing a Punch Holder by Welding

By Peter L. Budwitz

THE accompanying illustration shows how a punch holder which had worn to the point where it was unfit for further use, was sal-



Drawing of punch holder that was repaired by welding.

vaged by the welding method. The holes in which the punches are lo-cated in the block wear out much more rapidly than the remainder of the block, resulting in misalignment of the punches. In most cases this worn-out block is scrapped, and a new block has to be made.

It happened that a certain punch block which was badly needed was found to be so badly worn in the punch holes that it was useless for precise work. Since the remainder of the block was in good condition, it was decided to cut out the portion containing the holes and replace it with a new piece. Accordingly, the central part of the block was ma-chined out, the sides being under-cut

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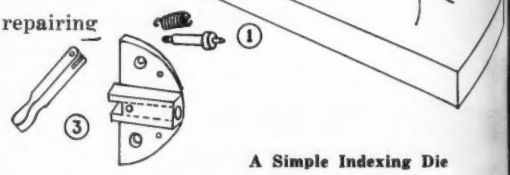
to form a dovetail as shown.

This done, a new section was machined to fit the opening and the corners at the joints indicated by the dotted lines in the drawing were beveled to receive the welding metal. The punch holes, indicated as 1 and 2, were bored in their proper locations. The section was then welded in place.

The net result was that not only was a considerable amount of material saved, but the entire operation of preparing the new piece, machining out the block, and welding in the new piece took much less time than would have been required to make an entirely new block. Part of this is due, of course, to the fact that the stem **B** is an integral part of the block.

No doubt this method of repairing could be adapted to many tool-holding devices that are subjected to severe service.



A Simple Indexing Die

A Simple Indexing Die

By Chas. H. Willey

THE development of inexpensive, serviceable tools for "small-lot" production is an ever-important consideration and the indexing die shown in the illustration Fig. 1 is a good example of such a tool. The tool shown was designed for piercing three equidistant holes in the shell of an instrument case.

The cases, a simple drawing of which is shown at Fig. 2, were open at each end, a lip being provided on the front end for the reception of a glass cover or "crystal." The construction of the die is extremely simple, yet the work produced with it is comparatively accurate. The unique feature of the die is the method of locating the work from the first hole punched, so that there can be no error.

The locating or indexing pin, shown

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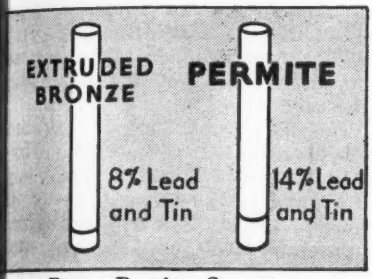

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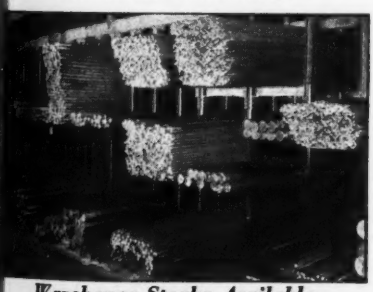

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in detail in Fig. 3, is nested inside the die as indicated at A in Fig. 1. The pin is under tension at all times, a spring being used to force it outward so that it will find the hole that has been punched. When the case in which the part is located has been revolved, after the first hole is punched, the pin indexes the work correctly for the second hole and the third hole is located from the second in the same manner. To allow the case to revolve, the pin is withdrawn by movement of the lever B.

With these tools, 400 cases—1200 holes—are punched an hour. This production is considered satisfactory on lots that are not large enough to warrant the outlay for a die that will pierce three holes simultaneously.

The actual cost of the die described here is small. An angle plate can be used for the frame and can again be used as an angle plate when the job is finished.

Dispenser for Prussian Blue

By C. F. Fitz

IN MOST shops the handling of Prussian blue by the mechanic is quite a messy job. Usually a part of each tube is wasted due to the tube being left open or as a result of the tube bursting, and the tube frequently become lost through careless handling. To overcome these conditions and assure an ample supply of Prussian blue at all times, the dispenser shown in the illustration was made.

The dispenser is easy to make and may be attached to the bench or lay out table where it will be within easy reach and yet be out of the way. It consists of an ordinary compression grease cup A attached in an inverted position to a frame B, as shown. The frame is of ⅛x1 inch flat steel or iron, bent at right angles. Two 3/16-inch holes are drilled in the

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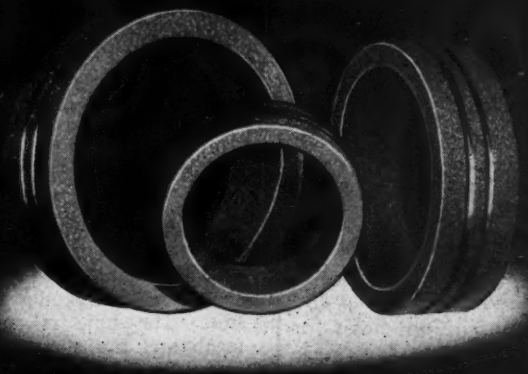

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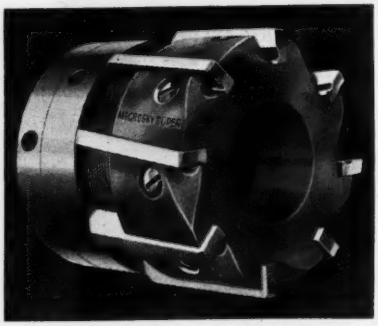

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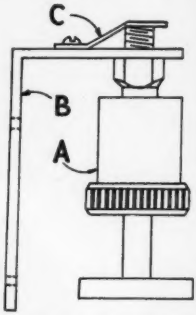
vertical section of the arm for fastening purposes, and the top is drilled and tapped with a ⅛-inch pipe tap to take the thread on the nose of the grease cup. The opening in the threaded end is kept closed against the entrance of air and dust by the use of the piece C, which is a short length of spring steel stock, bent as shown and attached to the horizontal arm of the frame.

In use, the grease cup is filled in



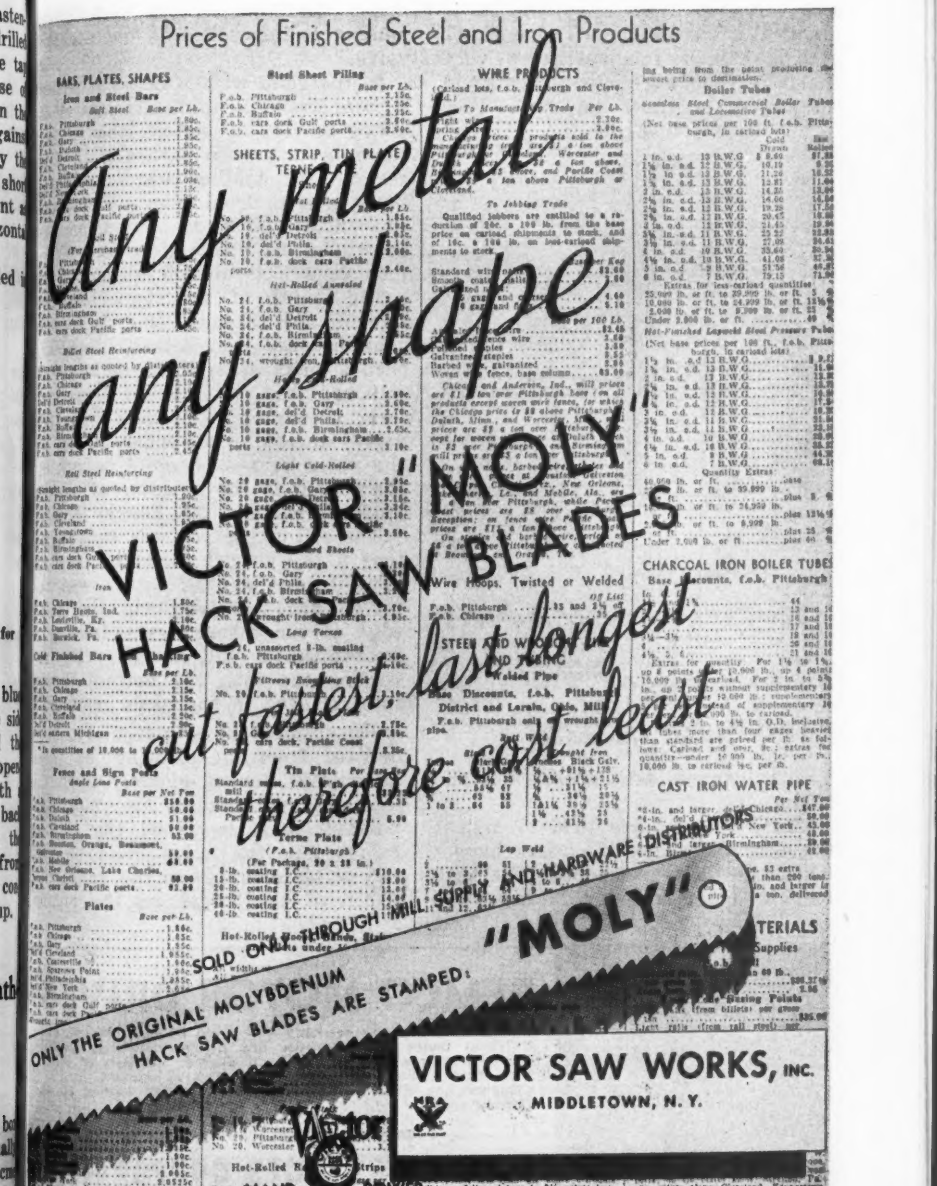
A Handy and Economical Dispenser for Prussian Blue

the usual manner with Prussian blue, then the spring is pushed to one side and the handle is turned until the Prussian blue exudes from the opening. The blue is removed with a swab and the spring is pushed back over the opening. By keeping the air from the blue, it is kept from becoming hard; thus the entire contents of the cup can be used up.

Device for Removing Feather Edge on Internal Acme Thread

By J. J. Thompson

LARGE valves, such as bridge boiler master valves, are usually equipped with stems having Acme square threads, due to the fact that the square thread is of such design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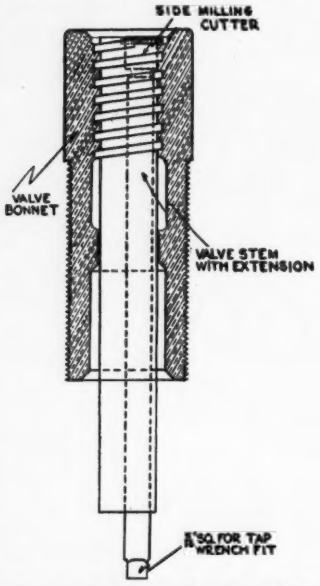
and strength that stripping it is practically impossible. The ends of such a thread run out to a very sharp feather edge, upon which, in the course of time, lime and other



Device for Removing Feather Edge on Internal Acme Thread

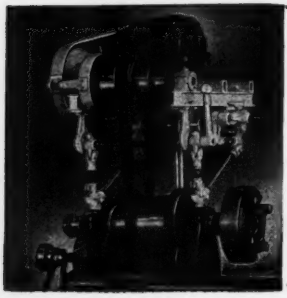
hard substances are deposited by the steam.

These obstructions tend to distort the first thread on the valve bonnet when the valve is opened or closed, and in many cases this distortion causes the stem to lock in position, making it impossible to operate the valve.

In the shop with which the writer is connected the difficulty described above became so serious that it became necessary to design a tool to remove the feather edge. Accordingly, a stem from one of the valves was fitted with an extension, as shown in the illustration, and a ⅜-inch hole was drilled through the entire length of the stem. At the top of the threads, this hole was counter-bored to ⅜-inch diameter, then a small side milling cutter was attached to a steel rod and the rod inserted through the hole. As the valve stem has the same thread as the valve bonnet, it could be run up the bonnet to the position where the knife thread on the bonnet begins.

The end of the rod was squared so that a tap wrench could be used to turn it, and as the cutter was revolved, the side teeth cut the knife edge of the thread down, leaving a smooth-radius full thread. By reversing the tool, the bottom thread was removed in the same manner.

Dimensions have purposely been omitted from the drawing, as these dimensions depend entirely upon the size of the threads. The most important point is to fit the milling cutter into the valve stem so that the cutter operates to the exact root depth of the thread on the bonnet.



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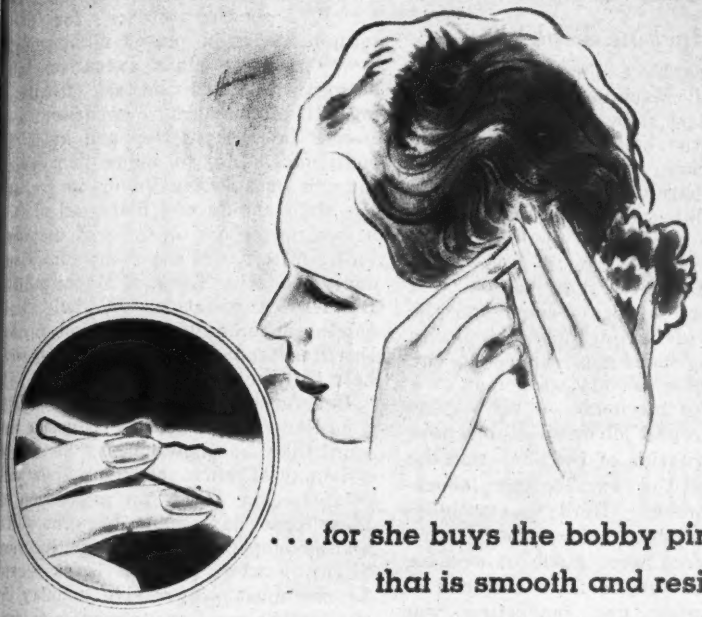

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Over the Editor's Desk

The Machine Tool Show

SIX years have elapsed since the Natonal Machine Tool Builders held their last show. Those six years witnessed the belts of American industry slacken, the wheels slow down until they barely turned, and the roar of the machines fade to an almost imperceptible hum. Fires died out under the boilers; huge furnaces stood stark and cold. Factories that had vibrated to the surge of press rams and the resonance of cutting tools on lathes and milling machines echoed to the footsteps of a solitary watchman or a maintenance mechanic on his way to perform a repair job on an idle machine.

The stagnation of the shop was not evident in the engineering laboratories, however. Here was activity. Plans were drawn for new designs; improvements were made in existing models; the respite from the load of manufacturing and marketing was utilized for the development of more modern equipment against the day when industry would respond to the summons of the factory whistle with renewed vigor and the call would go forth for newer and better tools.

Recent months have seen a resumption of industrial activity. Wheels are turning with ever-increasing speed. It is apparent that, unless some unforeseen calamity occurs, this country will shortly find itself working feverishly to supply a demand created by several years of consumption without production. In the face of such prospects, it is inevitable that keen competition, plus the ravages of time and obsolescence through the idle years will bring home to every plant manager and superintendent and master mechanic the necessity for replacing worn-out and obsolete equipment with equipment in which the advantages of new design and mod- ern construction are available.

Before orders for new equipment can be placed intelligently, however, these plant executives wil be confronted with the task of obtaining data and making comparisons between the many types and kinds of equipment. So, to make it possible for the prospective buyer to see, at one time and in one place, all of the newest types and designs of machine tools, cutters, and other machine shop equipment, the National Machine Tool Builders Association will hold, this coming autumn, what will probably be the greatest industrial exposition ever held in America.

In referring to the coming "Machine Tool Show" we wish to emphasize the point that the Show will not be simply a display of machines. This Show will comprise, in effect, an exposition of ideas that have been brought forth and developed by the best engineering talent in what we Americans regard as the most progressive country, in the world's most progressive age, during a time when their full time and energy could be devoted to the task.

No mechanical engineer or executive who makes any claim at keeping posted on the latest development in his profession can afford to miss this opportunity to obtain first-hand knowledge as to the advantages and possibilities of modern equipment.

Among the visitors at the 1929 Show were engineers from England, Russia, Germany, Italy, Japan, and other countries, sent either by their governments or their firms. If the Machine Tool Show is considered by other countries sufficiently important to make it worth while to send their men half way round the world, it should certainly be worth while for those of us who can reach it in a few hours and see it at the cost of a few dollars of expense money.

Now turn to page 33.

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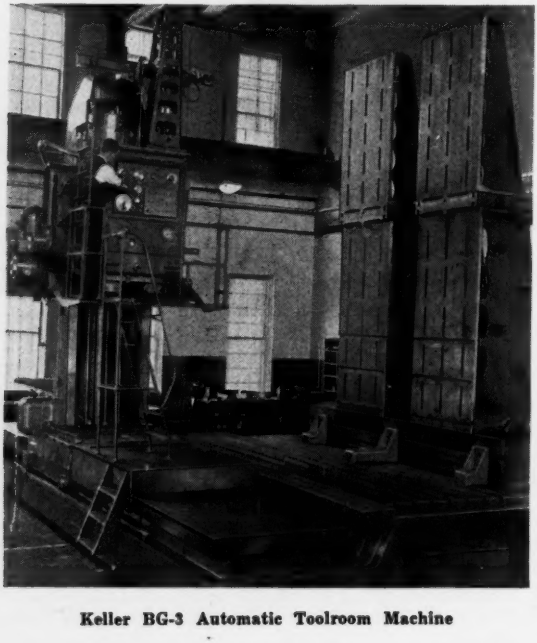
Keller BG-3 Automatic Toolroom Machine

A Kellar automatic toolroom machine of greatly increased size and range, incorporating new features that facilitate operation and the maintenance of the original accuracy over long periods, has been announced by the Keller division of the Pratt & Whitney Co., Hartford, Connecticut.



Keller BG-3 Automatic Toolroom Machine

In primary function, namely, the reproduction of dies, punches, welding fixtures and so on, from a master or model, and in principle of design and construction, this very large machine is similar to previous Keller BG types. Accuracy is such that very little hand-finishing is necessary, and in most cases the job is brought to the final finishing stage in much less time than it would take for the roughing operation alone on a hand-operated machine.

Like previous Keller automatics, the machine is operated by a simple electrical control through which the shape of a master or model is reproduced automatically. It may be used for two-dimension work, as in profiling, or for three-dimension cutting of solid forms such as dies. In either type of operation an electric tracer mounted on a bracket over the milling cutter passes over a master form bolted above the work on the fixture-upright and the cutter duplicates the tracer path precisely. The tracer controls a series of magnetic clutches which actuate the various motions of the machines. These motions are: horizontal movement of the column on the bed, vertical travel of the saddle and transverse movement of the entire head on the saddle. In addition, the new machine has spindle adjustment of 9 in. to and from the work.

Designed to cut an impression 12 ft. long by 6 ft. high by 30 in. deep without resetting of the die block, this new, large Keller machine—the BG-3—is suitable for the economical production of the enormous dies made necessary by radical changes in automobile bodies, such as the streamline and airflow designs and more recently, the all-steel turret tops. The machine weighs with fixture 154,000 lbs. In height it stands 21 ft. 1 in., while in length it is 32 ft. 5 in. and in depth 19 ft. 3 in.

In addition to its greatly increased size and greater power, the machine differs from its predecessors in a number of details. These include complete operating control with easy observation of the work from a platform on which the operator rides, a new tracer adjusting mechanism, made necessary by the unusual height of tracer above the spindle, the large fixture uprights, with steps and handrails on their sides and a trimmer appearance of the machine as a whole resulting from the elimination of a sep-

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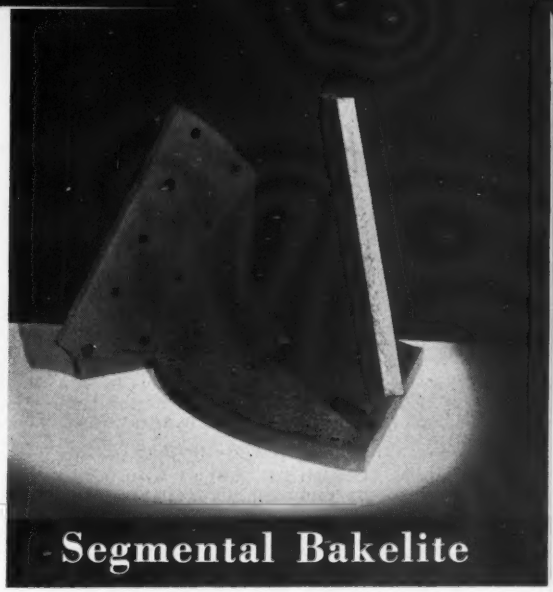

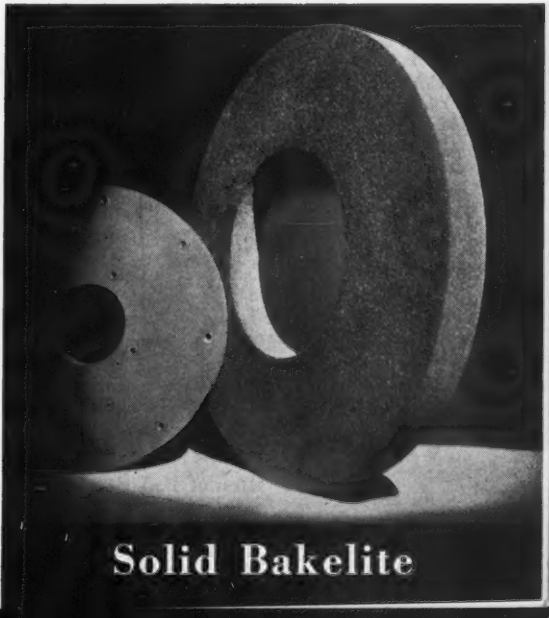

arate control cabinet, simplification of exterior wiring, harmonious design of gear boxes and other attachments, and from interior counterweighting of the head.

For this machine two interchangeable spline-driven spindles are furnished, identical except for length, and designed to permit full use of the transverse travel of the machine in the production of dies of different depths. The longer one has a maximum extension of 34 in. and the shorter, 10 in. from the head. They are 5¾ in. in diameter, are carried in 10-in. sleeves and are mounted in roller bearings. Drive keys facilitate use with face mills.

The spindle is driven as directly as possible through a 10-h.p. adjustable speed motor mounted vertically on the gear box. Gears are hardened and gear shafts are mounted in ball bearings throughout. Speed changes ranging from 10 to 800 r.p.m. are obtainable by means of three levers, and without pick-off gears. All gears are lubricated constantly by means of pump and piping within the gear box.

Horizontal and vertical travel of the head ranges from 1½ to 100 in. per min. As speed control in an extensive machine of this type must be easily available, the machine is arranged with the operating platform attached to the sa dle, the operator riding on the platfor thus having means for every adjustme at all times conveniently at hand.

The arrangement for driving the hor zontal and vertical motions of the ma chine is an outstanding feature, the driv for both being through a magnetic ge box on the rear of the column. Th magnets can be energized by push but tons or energized automatically und tracer control. Further control of spe is possible by rheostat in connectio with the gear box motor. Transver motion of the spindle head is effecte through a similar magnetic gear bo driven by an adjustable-speed moto Transverse speeds range from 3 to 36 i per min. The vertical leadscrew of th machine is driven from the magnet gear box through a shaft bevel gea

Bed ways are covered at all times b telescoping guards and platforms, an two indicators have been provided t show the operator the direction an speed of the horizontal and vertical mo tions. All bearing surfaces are oiled by an automatic force feed system, th pump of which is controlled magnetical ly by a contactor cam that is geared t the slide. Distribution of oil is liberal when the slide is in motion and limited when the need is slight.

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Chip disposal is by means of a motor-driven screw conveyor in a trough located between the bed and table of the machine. The chips are moved constantly toward one end of the bed, where they are dropped on to another conveyor and deposited into a large receptacle. Cutter coolant also drains into this trough; it flows over baffles to a long trough at the front of the machine, from which trough it is pumped through piping in the column, and re-used.

Cincinnati Motor Driven Universal Milling Attachment

Fewer set-ups and more accurate dimensions between milled surfaces are the results obtained with the Cincinnati Motor Driven Universal Milling Attachment shown in Fig 1. A shaft job with a slot and a flat milled at right angles, plus or minus 0.001-inch in squareness, is quickly milled in one setting without removing the shaft from the fixture. Die making, jig and fixture, metal patterns, and similar jobs are machined more quickly and accurately, because cuts can be combined and set-ups eliminated.

The Motor Driven Universal Milling Attachment is a self-contained unit, built into the machine overarm, and replacing the standard overarm supplied with the machine. It does not in any way interfere with the normal use of the overarm and arbor supports, as the spindle carrier can be easily swivelled out of the way.

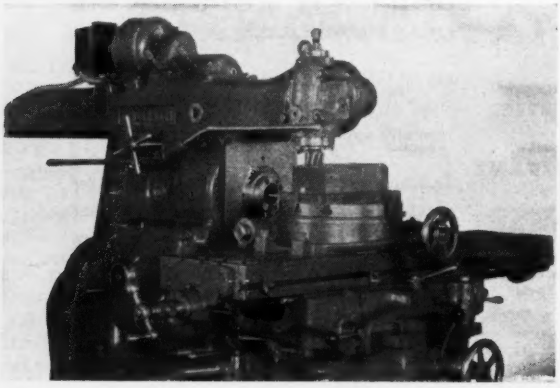


Fig. 1—Cincinnati Dial Type Miller Equipped with Motor Driven Universal Milling Attachment.

A constant speed 1 h.p. motor is mounted on top of the overarm and connected to the speed box by means of a flexible coupling. Nine changes of speed, ranging from 100 to 1030 r.p.m. are obtained through sliding gears. Speed changes are easily made from the left-hand side of the column by means of two gear shift levers. All shafts and

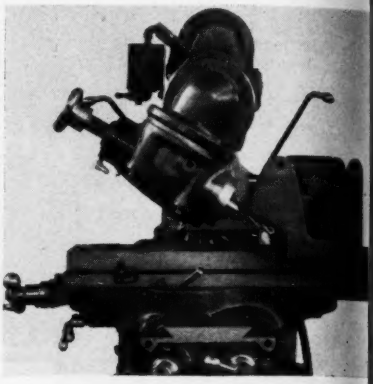
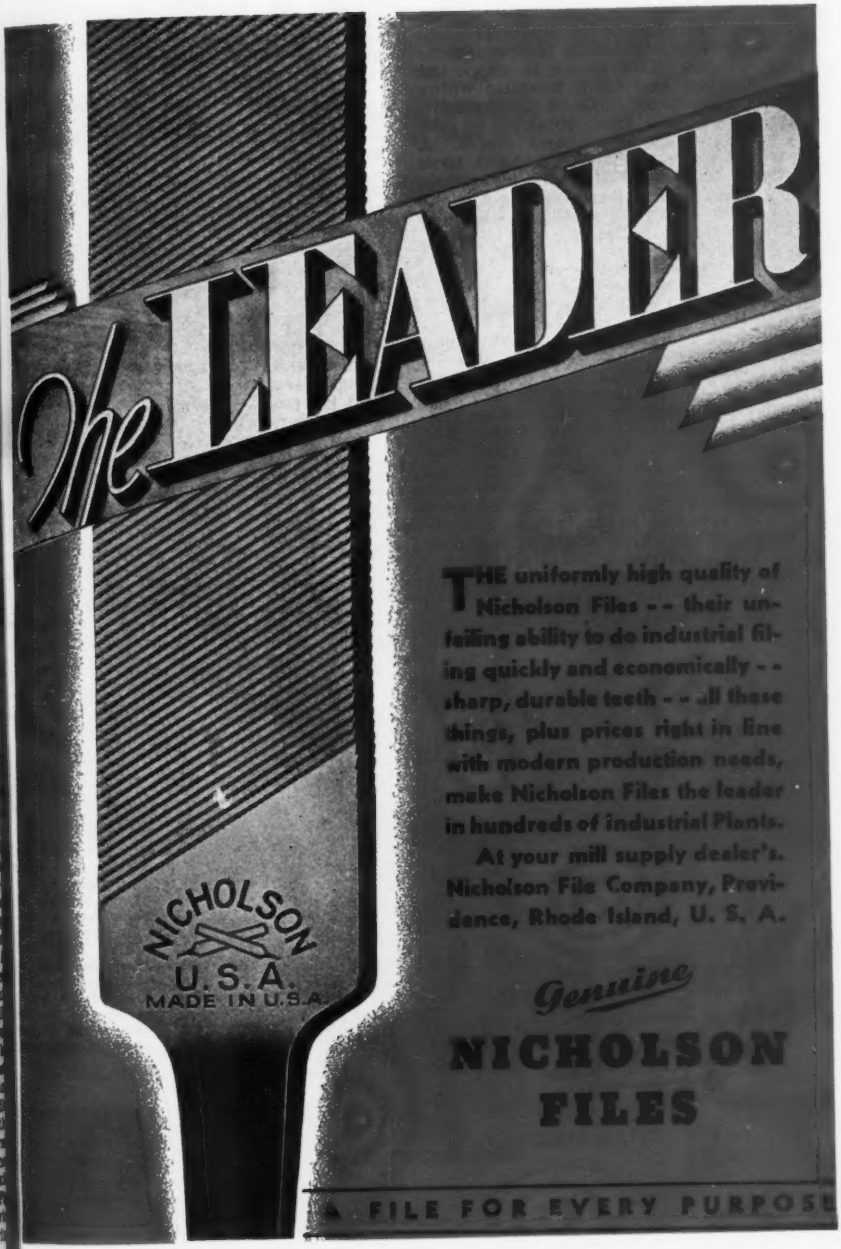


Fig. 2—Spindle Quill Device for Hand-Feed Boring

gears are made of heat-treated alloy steel with the exception of two bronze bevel gears which drive the spindle. Automatic lubrication and a visible oil gauge are assurance of efficiency and long life for the parts in the speed change unit.

Cutters are interchangeable between the attachment spindle nose and the spindle of the modern Cincinnati Miller, because they both are made to the same standard. The attachment spindle and the shafts in the swivelling units are mounted on anti-friction bearings. A draw-in bolt is supplied as standard equipment. One direction of spindle rotation is standard, but a reversing switch can be supplied, at extra cost, for reversing the rotation of the motor and spindle.

The flexibility of the Motor Driven Universal Milling Attachment may be increased by the addition of an auxiliary hand feed quill device, shown in Fig. 2, and supplied at extra cost. This device is convenient for drilling and bor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holes at an angle, not exceeding 3 inches in depth. It consists of a sleeve which fits into the straight hole in the attachment spindle. This sleeve is supported at the cutter end by a bushing which fits into the taper hole of the spindle, and is prevented from rotating by the key between the bush and sleeve. A draw-in bolt seats the taper shank tools firmly in the No. 7 B. & S. taper hole in the sleeve. The attachment is a product of The Cincinnati Milling Machine Co., Cincinnati, Ohio.

Thomson-Gibb Gun Welder

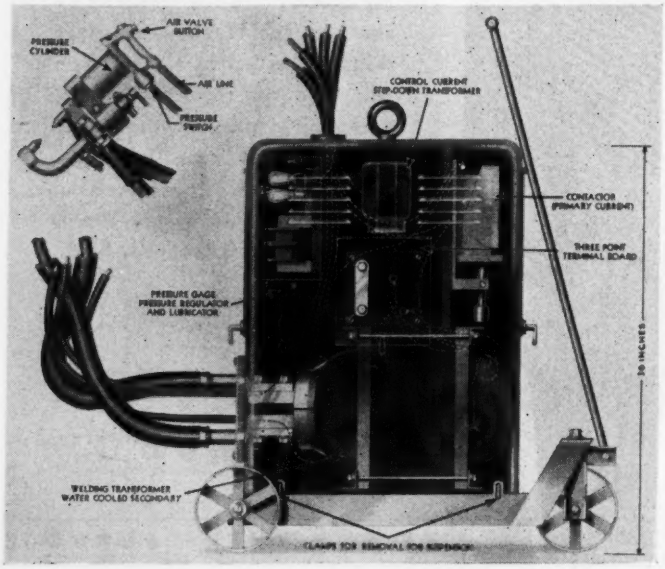
Bulky and cumbersome work upon which welding is required can now be welded with a portable welding machine known as the Thomson-Gibb Portable Gun Welder, made by the Thomson-Gibb Electric Welding Co., Lynn, Mass. The welding points are held in a "gun" that can be held in the operator's hand and can thus easily be applied to any part of the work, current being supplied from a welding machine which may be mounted either on a portable truck or suspended from an overhead hoist or crane.

The welder is ideally suited to progressive assembly line production and to methods of fabrication in which the work is held in jigs. Inasmuch as the "gun" is held in the welder's hands, it is an easy matter to make welds in close quarters where a stationary machine could not be used.

The Thomson-Gibb Gun Welder is a complete unit. The power transformer, step-down control transformer, heat regulator, contactor, weld timer, air regulator, and air gage are all housed in a compact steel cabinet. It is not necessary to run special lines for low voltage control circuits or to use outside contactors or timers. All controls are conveniently arranged inside the cabinet and are easily reached through properly-located doors.

The gun welder is designed to operate without developing unnecessary heat, no special water or forced air-cooled leads being necessary when the gun welder is used on work within its capacity. The weld timer, which closes the electrical circuit, automatically breaks it again at the precise instant in which the weld is completed. The transformer is purposely made large and oversize to supply a large volume of current for a short space of time. Only 1-20 to 1-3 of a second is required to make each weld, and at this speed there is no time for the leads or electrodes to accumulate heat.

The welding gun is standard and can be fitted with a wide variety of interchangeable yokes to handle all sorts of



Thomson - Gibb Gun Welder. The phantom view of the welding machine shows the major parts and their location in the machine. A view of the "gun" is shown in the upper left corner of the illustration.

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work, including special designs. The standard yokes are made of special 1½-inch heavy wall copper tubing bent to shape and fitted with a small inner tube which feeds cold water direct to the welding tips. The tips are of hard copper alloy.

The gun is equipped with a built-in pressure-operated limit switch arranged so that the welding current is automatically applied when the pressure in the cylinder reaches a pre-determined amount. The limit switch can be adjusted to trip at different air pressures to suit the requirements of the work. This automatic limit switch and the weld timer described above speed up the operation of the gun and greatly increase the number of spots per minute.

The gun and transformer shown in the illustrations are capable of welding clean metal of 16 gauge or lighter. Throat depths are limited to 12 inches or less. Special guns, yokes, and transformers are made for heavier work and work requiring larger throat depths.

Fellows Planetary-Type Gear Lapping Machine

The Fellows Gear Shaper Company, Springfield, Vermont, has placed on the market a Planetary-type Gear Lapping Machine particularly adapted to the lapping of small fine-pitch gears. On this machine the lap, which is of the internal gear type, is held stationary in the machine. Attached to the work-spindle of the machine is a self-contained planetary-type head carrying three supplementary work-spindles, in which arbors are retained for holding the work.

The planetary head is rotated by the main work-spindle and, as it rotates, carries the three work-holding spindles with it. Each spindle has a pinion attached to it and these mesh with individual internal gears, which are arranged to offer resistance to the free rotation of the work. In this way sufficient pressure is exerted to expedite the lapping operation. The planetary head in addition to being rotated is also reciprocated. The rotative motion distributes the lapping compound, and the reciprocating action accomplishes the lapping.

This machine can be supplied in several different arrangements to suit the character and shape of the work. The

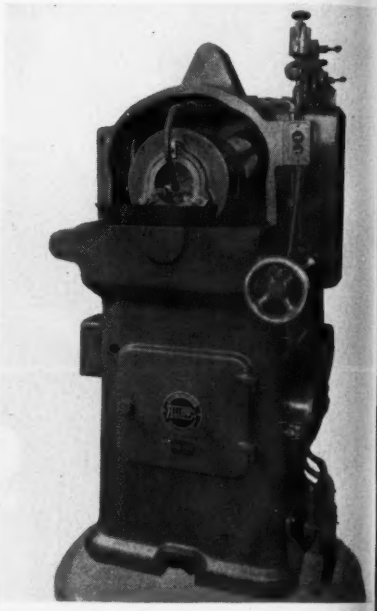

Fig. 1—Front view of Fellows Planetary-type Head Gear Lapping Machine for finishing small fine pitch gears.

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design shown in Fig. 1 is for lapping small gears which are 0.75 module, 30 teeth, 0.235 inch face width. The three work arbors each carry six gears. These gears are heat treated before cutting and are brought directly from the gear shaper to the lapping machine without removing them from the arbors. The actual lapping time does not exceed one-half minute for 18 gears.

To facilitate operation of the machine, an air ejector for the work arbors is provided. The air cylinder is attached

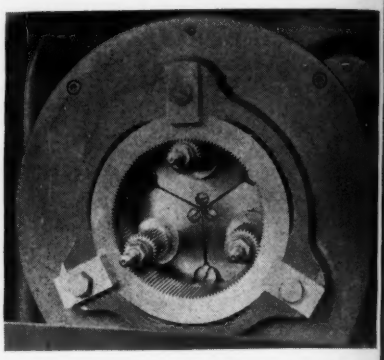

Fig. 2—Close view of machine showing work arbors and internal gear type lap.

to the rear of the machine work-spindle, and is operated by the foot treadle. Gears of different diameters are lapped by using internal-gear laps made to suit the diameter of the gears and the center distance of the three lap spindles. This method can be adapted to the lapping of both spur and helical external gears.

Cincinnati Combination Cut-off Machine and Grinder

The Cincinnati Electrical Tool Company, 2430 Madison Road, Cincinnati, Ohio, has announced the addition of a Combination Cut-Off Machine and Grinder to their line of electrical tools. The machine is designed to fill the need for a small unit suitable for tool room cutting and grinding and also for cutting and grinding specimens for microphotography in research laboratories.

The machine carries a 10x1-16-inch abrasive cut-off wheel on the right-hand side, operating at a peripheral speed of approximately 9000 s.f.m., and the material to be cut is fed into the wheel by means of a hand screw. The stock is

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held firmly on both sides of the cut, preventing wheel breakage, and a fully enclosed wheel guard affords perfect protection to the operator. The vise or holding fixture may be tilted to give any angle desired up to 15 degrees. The machine will cut stock up to one inch size in approximately 15 seconds, and the smaller sizes proportionately.

The left-hand side of the machine is equipped with an 8x1-inch grinding wheel with fully enclosed safety wheel guard adjustable to the wear of the wheel and with exhaust connection. An adjustable tool-rest is mounted on the wheel guard at the correct height.

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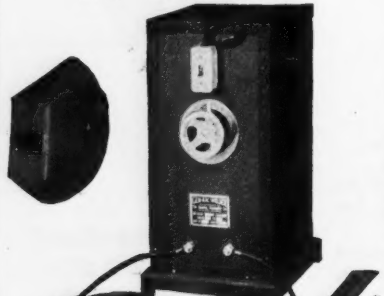

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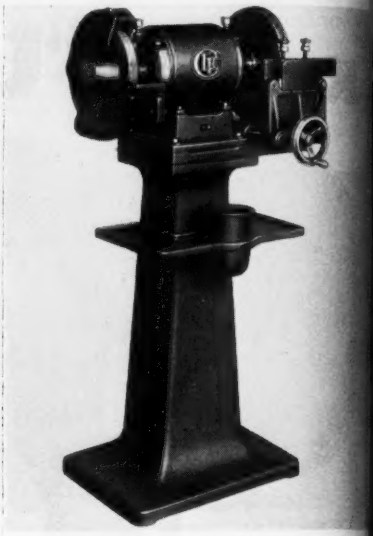
The motor is 1 h.p., fully enclosed with the rotor shaft mounted on overa ball bearings in dust-proof housings. two-pole starting switch is entirely en



Cincinnati Combination Cut-Off Machine and Grinder

closed in the base of the motor. Th machine may be had in floor type shown in the illustration or bench typ

Trimson Portable Surfacer and Polisher

A portable surfacer and polisher i cluding many unusual features in utili and design is being marketed by th Trimson Manufacturing Company, Cleve land, Ohio. In its lines, as shown the accompanying photograph, the ne machine reflects the influence of moder styling, and a wide choice of colors f the housing is offered.

One of the outstanding features is light concealed in the cover that cas its illumination directly on the work a without glare. The lip of the cover al forms a handle so that the machine ma be carried from job to job.

The machine is powered by a speci motor designed with many distinct features. The motor is within the dru is dust-proof, dynamically balanced a

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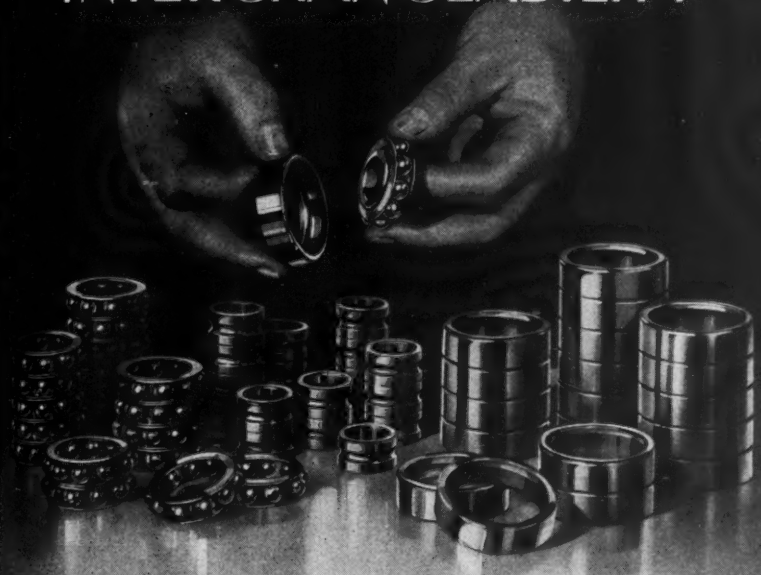

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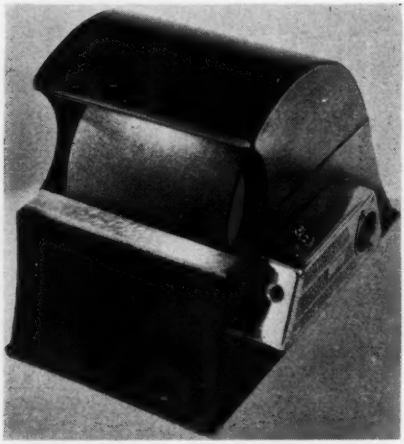


Trimson Portable Surfacer and Polisher

rotates in grease-sealed ball bearings. It is hung in a rigid metal chassis, cushioned in rubber and encased in a safety steel housing. The motors are available in two sizes, ¾ h.p. and 1 h.p.

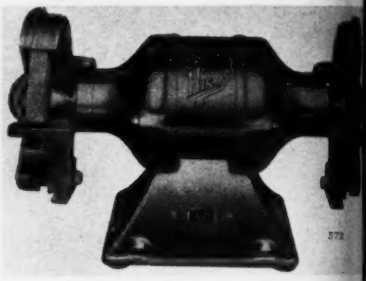
The rotating motor drum has a cush ioned surface over which paper or cloth abrasive and polishing sheets are used Abrasive surface can be changed in a few seconds. The drum is 6 inches wide and 7 inches in diameter. The surface speed is said to be almost a mile a minute. The motors operate on 110 or 22 volts, 60 cycles A.C.

In shop demonstrations, the Trimson surfacer and polisher has been used in finishing several different metals, wood bakelite, carbon, fibre, and hard rubber It is said to be exceptionally fast and efficient for removing burrs, cleaning and finishing castings, polishing, sanding patterns, chamfering carbon brushes sharpening tools and for other uses.

The machine weighs 50 pounds, is 14½ inches long and 10 inches wide and 10½ inches high.

Hisey ⅓ H.P. Double End Bench Grinder

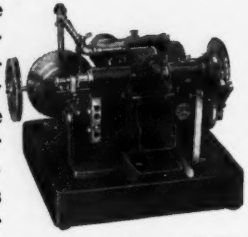
The illustration shows the "Hisey" 1-3 h.p. double-end bench grinder which



Hisey 1/3 H. P. Double End Bench Grinder

has been placed on the market by The Hisey-Wolf Machine Co., 2745 Colerain Ave., Cincinnati, Ohio. The grinder

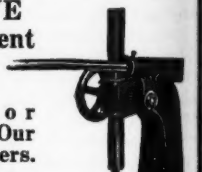
"Waltham" Pinion Cutting Machines



Are made with a variety of equipments. They will make the two or three successive cuts needed for watch pinions or may be used for fine pitch gears up to 1½" diameter. There is also a 4" size. If you will describe your work we will send details.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

RELIEVE Unemployment
of
Your Arbor Press with Our Keyway Cutters.



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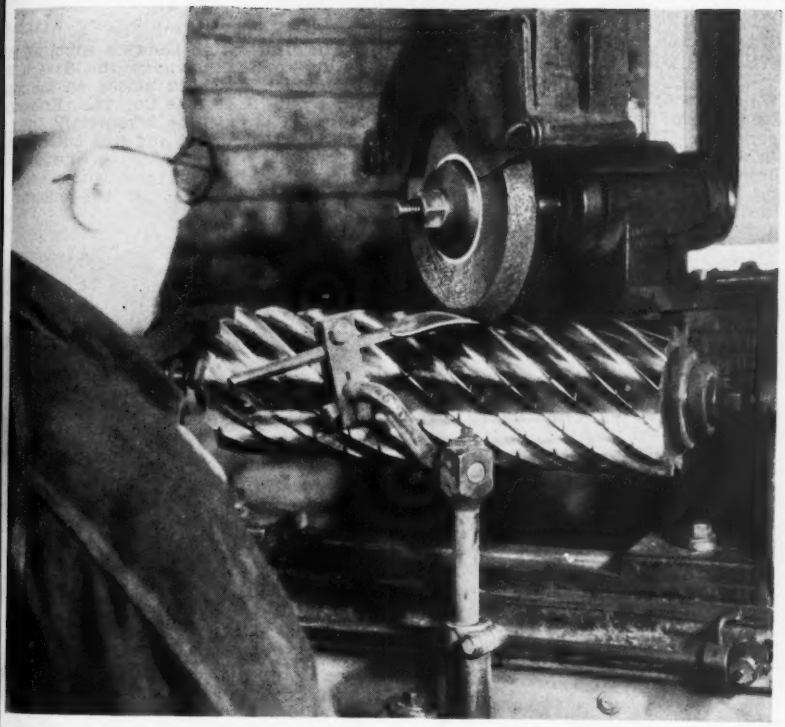
Greenfield, Mass.

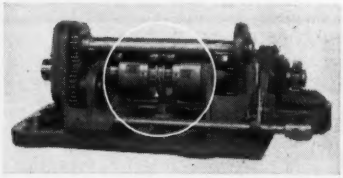
MACKLIN
TOOL ROOM
WHEELS



Highly efficient Macklin Grinding Wheels are here shown grinding H.S. milling cutters. Work of this character is very exacting and skilled operators will only use wheels they know will do the job in first class shape. They usually specify Macklin Tool Room Wheels because they fulfill all of the requirements they demand. Besides their use in grinding milling cutters Macklin Wheels offer a limitless diversity in tool room use. Let Macklin tell you more.

MACKLIN COMPANY

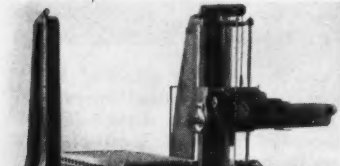
Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.
Sales Offices:—Chicago—New York—Detroit—Pittsburgh—Cleveland—Cincinnati—Milwaukee



SATISFACTORY PERFORMANCE UNDER CONTINUOUS OPERATION

"We had to obtain satisfactory performance under continuous operation. This was accomplished by using Twin Disc Close Coupled Duplex Clutches", says K. F. Gallimore, Chief Engineer, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. "We have used Twin Disc Clutches for the past twelve years, and they were selected for our new 30 series Precision Horizontal Boring, Drilling and Milling Machine for their — compactness of design, allowing installation in a minimum space . . . ease of assembly, as they can be built into the machine as an assembled unit . . . simple and positive locked adjustment . . . dependability of operation. Considerable economies were obtained by reduction of service and replacement figures to an extremely low figure." Write for engineering data. Specific recommendations on request.

Twin Disc Clutch Company, 1326 Racine St., Racine, Wis.



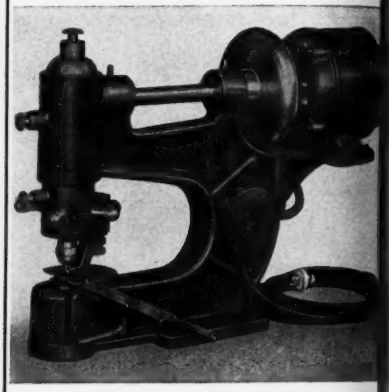
TWIN DISC CLUTCHES

sturdily built throughout, and is intended for use on all sorts of light tool and miscellaneous grinding jobs. It is motor driven, being made for 115 and 230 volt direct current when a split-phase motor is used and for 220 or 440 volts if a 3-phase squirrel cage motor is used.

The grinder takes a 7x¾-inch wheel. The spindle runs in ball bearings which are sealed against dust and dirt.

Savage No. 109 Nibbling Machine

The illustration shows a nibbling machine, to be known as the Savage No. 109, which has been placed on the market by W. J. Savage Co., Inc., Knoxville, Tenn. The machine is especially intended for both templet and line cutting, and the design incorporates a number of newly developed features which make it especially adaptable for the cutting of



Savage No. 109 Nibbling Machine

special and difficult shapes at high speed.

The machine has a capacity of ⅛ in. in mild steels and 1/16 in. in tough alloy metals. Being intended for toolroom work or for comparatively light manufacturing, it is made in the bench type, as shown. Feed is from 36 to 60 in. per minute. A ¼ h.p. repulsion start-induction motor is used, driving direct. The net weight of the machine is 125 pounds.

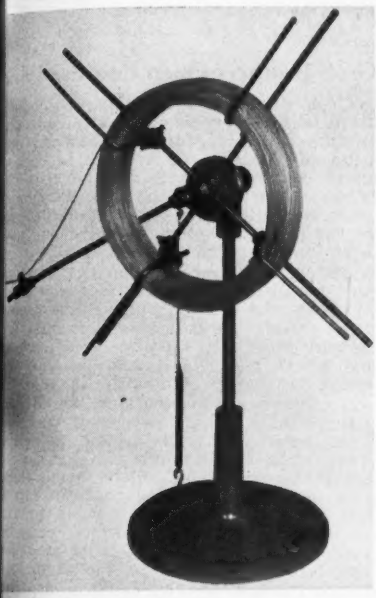
Among the features of the machine are adjustable tools and dies, revolving head and an adjustable ram bushing.

Littell No. 0 Reel With Automatic Brake

A new No. 0 reel with an automatic brake, designed to hold coils of stock weighing up to 100 lbs., has just been

placed on the market by the F. J. Littell Machine Company, 4127 Ravenswood Ave., Chicago, Ill.

This reel is mounted on needle bearings so that it runs very easily, and



Littell No. 0 Reel with Automatic Brake

the automatic brake prevents the stock from unwinding too rapidly. When the stock is pulled forward, the roller rises, releasing the automatic brake so that stock can be pulled without any resistance from the reel, but as soon as sufficient stock has been unwound, the spring pulls the roller down and throws on the brake.

When fitted up with arms, the No. 0 reel will handle coils 9 in. inside diameter, 32 in. outside diameter, and 3½ in. wide. When fitted with plates, this reel will handle coils 1¾ in. inside diameter, 32 in. outside diameter and 3½ in. wide.

Ransom No. 101 Grinder

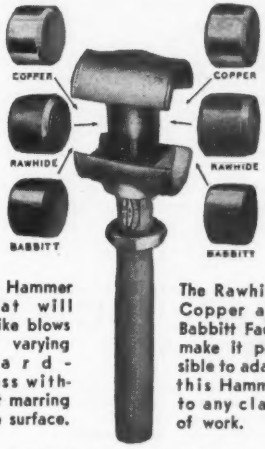
The illustration shows a grinding machine especially designed for using up stub grinding wheels; that is, wheels that are too small to use with the standard type of grinding machine. The ma-

Speeds up the Work
Without Doing Damage

In finishing and assembly work it is often desirable to use a hammer that can strike more than one kind of blow.

Any combination can be secured by the quick adjustment of the necessary faces. Made in five different sizes.

A soft-faced hammer of improved design and construction.



A Hammer that will strike blows of varying hardness without marring the surface.

The Rawhide Copper and Babbitt Faces make it possible to adapt this Hammer to any class of work.

Send for Full Particulars

GREENE, TWEED & CO.

Sole Manufacturers

109 Duane St. New York

chine is built by Ransom Grinding Machine Company, Oshkosh, Wisconsin.

Normally, new grinding wheels are made to 12 or 14 inch diameter and when such wheels are worn down to approximately 7 inch diameter, they are getting down to a point where they are too small for use on the standard machines. The

Ransom No. 101 Grinder

machine illustrated is especially designed to take these 7 inch diameter wheels; thus when the wheels are worn down to this diameter they are transferred from the regular machines to this machine for further use.

The distance between wheels is 42 inches and the size of the arbor where the wheels fit is 1½ inch diameter. However, it can be made smaller if desired. The motor is 3 h.p. and is suitable for 3 phase, 60 cycles, either 220 or 440 volts at 3600 r.p.m. The machine as shown in the photograph is without rests, but adjustable rests can be provided. The guards have hinged doors and exhaust pipe openings and are adjustable for the wear of the wheel. The machine is regularly furnished with push button starter. Weight, approximately 650 pounds.

Grob Brothers Open End Band Saw

Grob Brothers, West Allis, Wisconsin, have added to their line of continuous-motion filing machines a band saw for internal sawing. This machine, designated as an "Open End Band Saw," is intended for use in the manufacture of tools and dies, the outstanding feature of the machine being the speed and ease with which internal sawing can be done.

The principle of the machine involves the winding up of a 150-foot saw band helically over a drum and looping it over three guide sheaves, arrangements for forward motion at cutting speeds, reverse motion at high speed, and facilities for quick setting-up to do internal sawing.

To arrange the machine for sawing out a die, it is only necessary to release the tension on the saw band (which is done by a single lever movement), remove the front end of the band which is fastened with a self-tightening eccentric clamp to the drum, insert it through an opening in the die, which must be large enough for the band to pass through, reconnect it to the drum, and apply tension to the band. The time required to complete this is about one half minute. The machine will saw at the lowest cutting speed for three minutes, at which time the end of the band will have been reached and the machine will stop. Only 18 seconds is required for the return of the band and the machine is ready for another three minutes of sawing.

The drum is mounted on a threaded spindle so that, when revolving, it screws

WEL-DON DOUBLE-END MILLS
"Cost-Cutting Cutting Edges"
Wel-Don long lasting "double-back-off" edges and quick-chip-ejecting hollow-ground flutes give you "the edge" on your competitors . . . . through
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FASTEST FEEDS
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EAST OF THE 95th MERIDIAN AND NORTH OF THE 35th PARALLEL

4680 COMBINATIONS OF DANLY DIE SETS CAN BE IN YOUR SHOP TOMORROW MORNING

AND IN COMPARABLE TIME ANYWHERE

- 4680 combinations of Danly Standard Die Sets can be shipped from each Danly Branch Office-Plant in 24 hours from each of these 6 points—4680 combinations of size, thickness and material of shoe and punch holder, bushings and length of pin.

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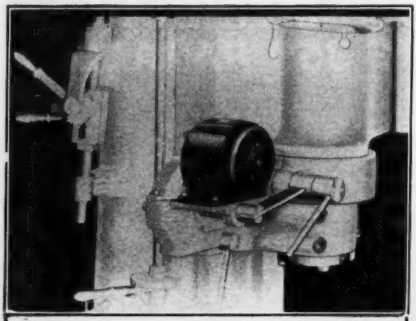

Ohio Torque Motor applied to clamp arm of radial drill column

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There are many situations where torque motors can be used to advantage in place of solenoids, magnets, air or water cylinders, and such devices and thrustors. Ohio Torque Motors are widely used in elevator service, and in other lines for setting clamps, turning valves and so on. They are easily applied and often effect great savings, both in installation and maintenance costs. Available in sizes from 3 to 64 ounce feet torque. All ball bearing equipped.

Our engineers will gladly discuss with you the application of Torque Motors to your work.

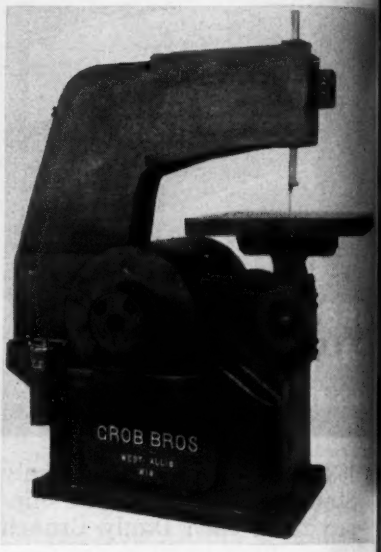
The Ohio Electric Mfg. Co.

5918 Maurice Ave., Cleveland, Ohio

OHIO MOTORS

itself back and forth, winding and unwinding the band. The drum is tapered to compensate for the saw band being heavier on the front or teeth side. A small guide wheel covered with rubberized fabric holds the saw band tightly to the drum when the tension of the band is released, preventing the band from loosening on the drum.

All revolving members are of aluminum, the light weight making possible



Grob Brothers Open End Band Saw

a high rate of speed as well as quick stopping. A limit switch and brake on the drum provide for stopping the drum at the desired point.

The band saws used with the machine are 0.025 in. thick, of ⅛, 3-16, or ¼ in. width, and 150 ft. in length. The band is wound onto the drum by means of a removable loader sheave on which it is first coiled. The front end of the band is looped over the guise sheaves and fastened back to the drum.

Cutting speeds of 50, 75, 100, and 150 ft. per min. are available in addition to a reverse speed of 500 ft. per min. The two motors required are mounted in the base. A variable speed motor drives the forward motion and a single speed motor drives the reverse, multiple V-belts being used to transmit power.

Your permanent fastenings can be made CHEAPER, too

SAVED 50% of assembly cost
ELIMINATED 20 tapping operations
STOPPED 30% spoilage of parts in tapping
SIMPLER—CHEAPER lock design secured
COSTS HALVED on radio speaker fastenings

This Simpler Method cuts costs on all kinds of products and fastenings to many materials

Twenty thousand concerns are saving money by making permanent fastenings with Parker-Kalon Hardened Metallic Drive Screws. Their applications range from name-plate attachments to assemblies requiring great security. Among them must be fastenings almost identical to yours. That's why it is reasonable to believe that you, too, could cut costs by adopting the same simpler method.

Just consider how much faster . . . how much easier these unique Screws can be used than machine screws, rivets, bolts and nuts, pins, etc. You merely hammer Hardened Metallic Drive Screws into drilled or formed holes. They cut their own thread in iron, brass and aluminum castings, steel and plastics. And they hold more securely than machine screws . . . unbiased tests prove it.

It costs nothing to try this simpler means of making fastenings, and a trial may pay large returns. Just send a brief description of the fastenings you want to make so we can furnish proper samples FREE for your test.

PARKER-KALON CORPORATION
Dept. M, 198 Varick Street New York

PARKER-KALON TYPE "U" Trade mark HARDENED METALLIC **DRIVE SCREWS**

PATENTED No. 1,483,151 - No. 1,912,522 - No. 1,978,145 - No. 1,978,329

TRY THESE, TOO

Type "Z" Hardened Self-tapping Sheet Metal Screws
For joining and making fastenings to sheet metal up to six gauge; also aluminum, die castings, Bakelite, etc. Simply turn Screw into drilled, pierced or molded hole. It forms a thread in the material as it is turned in. Can be removed and replaced.

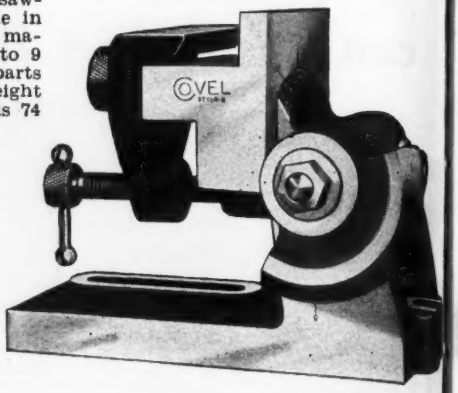
Hex Head Hardened Self-tapping Cap Screws
For making fastenings to sheet metal from 24 gauge to 10 gauge, and also to steel plates and structural shapes up to ½ inch thick, solid brass, bronze, die castings, etc. They function like the Type "Z" Screws but are driven with a wrench

Parker-Kalon Products are sold only through recognized distributors

Control is entirely electric, the push buttons being conveniently located for the operator. The machine can be set to reverse itself automatically. The sawing table is 24x28 in. and is tiltable in two directions. The throat of the machine is 25½ in. and material up to 9 in. in height can be sawed. All parts of the machine are guarded. The weight is 2,000 lbs. and the overall height is 74 inches.

Covel Style B Universal Angle Vise

The illustration shows the new Style B Universal Angle Vise which has been added to the line of Universal angle vises made by the Covel Manufacturing Co., Benton Harbor, Mich. Any combination of angles required in milling, drilling, grinding, or otherwise machining tools or machine parts can be obtained with the Covel Universal Angle Vise. The work is held by a fulcram clamp, and the angle adjustments are positively locked by means of hardened nuts. The locking arrangement is sufficiently positive and rigid so that the vise can be used on a surface grinder, milling machine, drill press, or shaper under the pressure o



Covel Style B Universal Angle Vise

normal cuts without danger of slippage.

The vise is especially useful in grinding carbide tools or other tools in which many complicated angles are required. Predetermined angles and clearances may be produced quickly and accurately. The vise is finished in accordance with accepted standards of tool room finish.

The base dimensions of the Style B vise are 4⅜x7⅞ inches. Width of jaws, 4 inches; maximum opening, 2½ inches. Weight, 20½ pounds net. The Style A vise, which is smaller, is made to base dimensions of 3x4½ inches with jaws 2¾ inches wide, opening to a maximum of 1¼ inches. This vise weighs 7 pounds net.

Rockwell Superficial Hardness Tester

The "Rockwell" Superficial Hardness Tester shown in the illustration, a product of Wilson Mechanical Instrument Co., Inc., 385 Concord Ave., New York N. Y., is a special purpose machine intended exclusively for hardness tests where only very shallow penetration is possible and where it is desired to know the hardness of the specimen close to the surface. It was designed particularly for testing nitrided steel, safety razor blades, light carburized work and brass, bronze and steel sheet.

The Rockwell Superficial Hardness Tester operates on exactly the same prin

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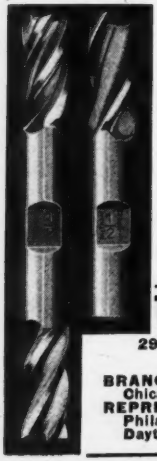
HI-SPEED
END MILLS



Putnam tools are designed and manufactured by engineers having many years experience in filling tooling requirements. Every Putnam Hi-Speed tool is a quality product.

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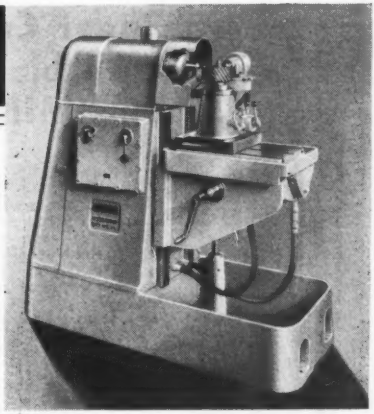
are used to secure accurate measurements in making and inspecting limit or standard gages—to establish standard sizes—and for checking precision in all kinds of toolmaking and laboratory work. They save time on tool, jig, fixture, gage and production operations. Available in Inch or Metric System. *Manufactured and Serviced by*

FORD MOTOR COMPANY
JOHANSSON DIVISION DEARBORN, MICHIGAN

GEAR TOOTH ROUNDING



The No. 35 Cross Gear Tooth Rounder is unique because it will round, chamfer or burr all types and sizes of gears and splined shafts within its rated capacity. It will easily handle spur, helical, herringbone, spiral bevel, hypoid gears and straight or tapered splined shafts.

Individually centralizing each tooth in exact relation with the cutter and holding the gear absolutely rigid during the cutting operation are characteristic features of the No. 35 Cross. This machine is devoid of all mechanisms of a special nature—there are no cams, master indexing plates or indexing gears—and it may be quickly and easily set up and changed over to handle a wide variety of work without incurring any secondary or additional expenses.

Regardless of your present methods or equipment, it is universally recognized that your standards of quality can be raised and your production costs reduced by installing one or more No. 35 Cross Gear Tooth Rounders.

CROSS GEAR & MACHINE CO. 3250 BELLEVUE, DETROIT, MICH.

Specialists in Cut-to-Order Gears

Diefendorf specializes in cutting gears to customers' blue prints. Spur, Straight, Bevel, Spiral Bevel, Helical Internal, Worms and Worm Gears cut in all metals — and in Celeron, Micarta, Formica, Fabroil, Rawhide and Textolite.

Let us quote on your gear requirements.

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Shear Cut Double End Mills

THEY shear cut the metal with the greatest of ease, and leave a finish as smooth as velvet.
It's the way they are ground.
Give them a trial and see for yourself.
You get two for the price of one.

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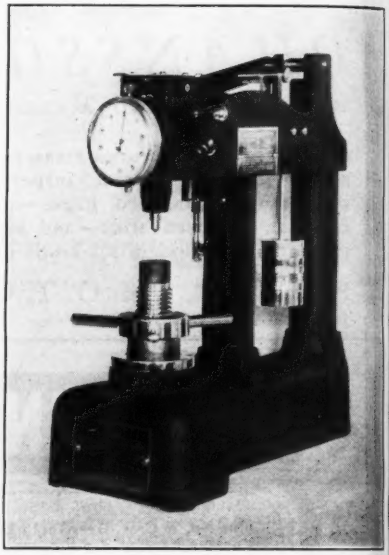
ciple as the regular "Rockwell" hardness tester, but the "Superficial" machine operates with much lighter minor and major loads and has a much more sensitive depth measuring system.

Instead of the 10 kg. minor load and the 60, 100 and 150 kg. major loads of the regular Rockwell, the Superficial Tester applies minor load of only 3 kg. and major loads of 15, 30, and 45 kg. Whereas hardened tool steel is penetrated to a depth of about 0.0035 inch on a regular Rockwell C scale test, the Superficial Tester, on metal of the same hard-



"Rockwell" Superficial Hardness Tester

ness and with the customary 30 kg. major load, would penetrate to only about 0.0010 inch depth.

One point of hardness for any test made with the Superficial machine corresponds to a difference in depth of penetration of only 0.001 millimeter, or approximately 0.00004 inch. As with the regular Rockwell tester, the hardness readings are taken from the one and only dial gage on the machine. The same 1-16 inch diameter steel ball penetrators as used with the regular Rockwell are employed on brass, bronze and unhardened steel in the Superficial tester.

On hard steel surfaces a sphero-conical diamond "Brale" penetrator is used, but because of the smaller penetration

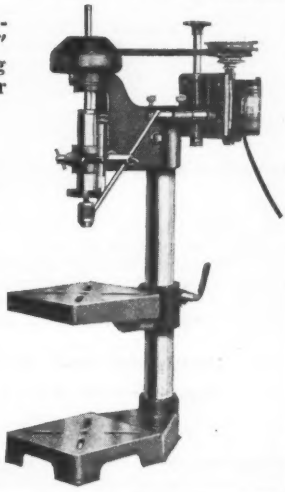
For Heavy Duty $32.25 LESS MOTOR

A big, strong drill press—precision-built and production-priced, including JACOBS $\frac{1}{16}$" to $\frac{1}{2}$" chuck. Many leading manufacturers are using batteries of these Atlas tools in their regular production work.

This Bench Model stands 40 inches high, maximum distance base to chuck jaws, 19 inches. Drills to center of 15-inch circle. Choice of solid or swivel table.

FOUR large, deep-groove SKF bearings—two in the head, two more in the quill—assure permanent accuracy and smooth, quiet operation. Nine speeds, from 600 to 5,200 R.P.M. Special Atlas speed reducer ($3.95 extra) reduces to 200 R.P.M., gives press ample power to run ½" drill in steel.

Other ATLAS Drill Presses, both bench and floor models, at $13.95, $22.45 and $33.45. Send for Free Catalog with pictures and full specifications.



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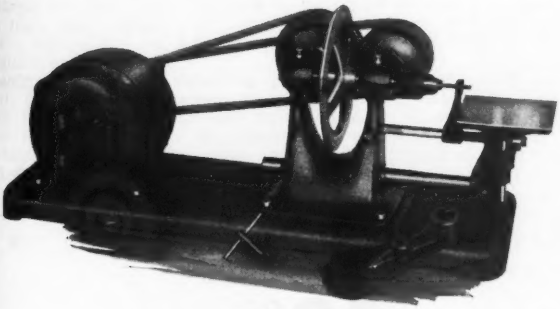

This is a 3-16" Motor Driven Bench Tapper

Efficient and Convenient

We Make Many Sizes and Styles of Friction Driven Tapping Machines.

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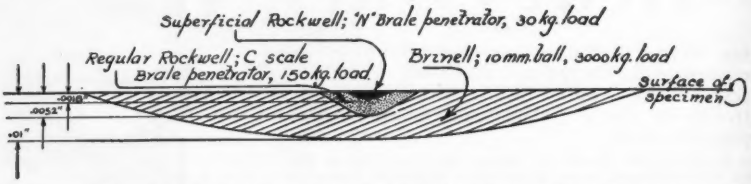
RICKERT-SHAFER CO. . . . Erie, Pa.

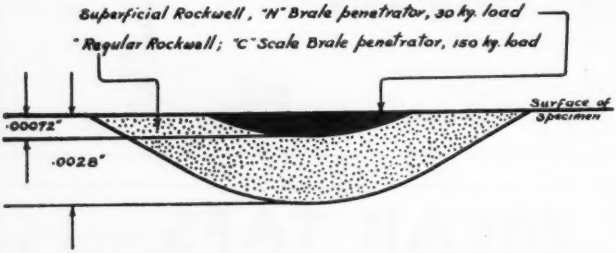
the Brale for the Superficial machine must be shaped with still greater microscopic precision. This Brale is marked



Comparative depths of penetration in a piece of metal of hardness C 39 on the regular Rockwell, 30-N60 on the Rockwell Superficial, and 362 Brinell.

and called the "N" Brale to distinguish it from the regular Brale.

In recording readings obtained on this special model for Superficial hardness testing, the value of the load in kilograms is written first, then the letter N


Superficial Rockwell, "N" Brale penetrator, 30 kg. load
Regular Rockwell; "C" Scale Brale penetrator, 150 kg. load
Surface of Specimen
.00072"
.0028"

Comparative depths of penetration in a piece of hard steel of Rockwell C 65, as determined on the regular Rockwell, and of hardness 30-N82 on the Rockwell Superficial.

if Brale N is used or the letter T if $\frac{1}{16}$-in. ball is used as the penetrator, and third, the dial reading. The scale pan alone applies 15 kg. major load and each of the weights 15 kg. more, so that load may be 15, 30, or 45 kilograms.

Every hardness test made with a Superficial Hardness Tester is based upon a depth of indentation of less than 0.005 inch. It is practically always less than 1-10 mm. In hard steel the depth of indentation is approximately 0.001 inch, or 0.025 mm. By keeping in mind that any sort of penetration hardness test is influenced by the hardness of the metal tested to a depth of at least ten times the actual depth of indentation, it will be very evident that thin metal or thin, hard cases can accurately be measured only by shallow indentation. The accompanying diagrams will be of interest in this connection.

In testing nitrided steel or lightly carburized steel it is essential to make but a shallow impression in order that the hardness reading shall depend alone upon the hardness of the nitrided case and not be influenced by the hardness of the underlying core. Rolled sheet metal, ferrous or non-ferrous, is something for

NATIONAL Tool Salvage Service will save you approximately

50%

on Milling Cutters, Drills and Reamers.

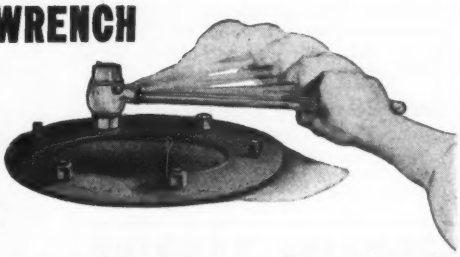
NATIONAL TOOL SALVAGE COMPANY

3818 Beaubien St. Detroit, Michigan

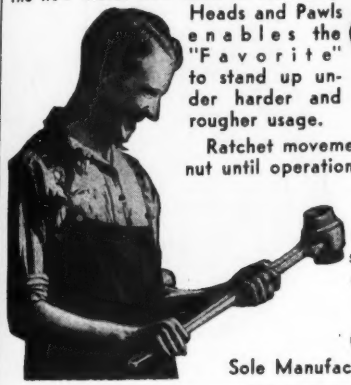
SPEED UP NUT TURNING with the . . .

FAVORITE REVERSIBLE RATCHET WRENCH

WORKS ON A QUICK STRAIGHT-AHEAD RATCHET MOVEMENT



The new metal now used in Handles, Heads and Pawls enables the "Favorite" to stand up under harder and rougher usage.



Ratchet movement eliminates all lost motion. Does not leave the nut until operation is completed.

A TIME-SAVER

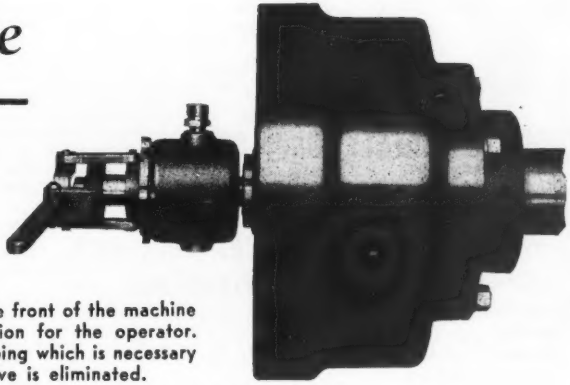
Can be used in narrower places than an ordinary wrench. Each head can turn two different-size nuts, one in each end. Opening in head allows bolt to pass clear through.

Send for full particulars

GREENE, TWEED & CO.

Sole Manufacturers 109 Duane St., New York

No Separate Valve—



is required for Hopkins Series "C" Cylinders. The valve is a part of the distributor. These cylinders require only a rod from the distributor lever along the front of the machine to a convenient position for the operator. Also the additional piping which is necessary for the "separate" valve is eliminated.

WRITE FOR CATALOG

THE TOMKINS-JOHNSON COMPANY

620 N. MECHANIC STREET, JACKSON, MICHIGAN

which the Rockwell Superficial is said to be particularly adapted. When sheet is both thin and soft, it becomes advisable to use an anvil with a polished diamond center, partly to insure the plane surface that is essential and partly to standardize the frictional effect of the anvil as the metal of the sheet flows laterally under the test.

Landis Revolving Die Head With Taper Attachment

A revolving die head with taper attachment for producing tapered threads has been brought out by the Landis Machine Company, Waynesboro, Pa. The head is an adaptation of the ¾-in. Lanco head, but has a standard capacity up to 1¼ in. American Tapered Pipe Thread with a maximum thread length of 1¼ inch. By using special oversize chaser holders, diameters up to 2¾ in. can be cut with a maximum thread length of 1⅛ in. Any degree of taper can be provided up to 2 in. taper per ft. by using the proper operating ring and cam shoe. The head is suitable for application to practically any make of automatic chucking machine employing a revolving type of die head.

Landis Revolving Die Head with Taper Attachment

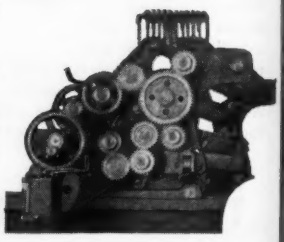
The taper cutting action is obtained through a cam which is integral with the operating ring. Attached to the closing ring of the die head is a cam shoe which is machined to correspond to the operating cam. As the threading spindle moves forward, the closing yoke on the die head

PRECISION TAPPING
with the New
"PROCUNIER"
HIGH SPEED, BALL BEARING
TAPPING ATTACHMENTS

Smoother--More Sensitive--Compact

Double-Cone, Long Life, Cork Faced, Friction Clutch.
Three Sizes With Capacity up to ½" in Steel.
Also other Styles and Sizes
Write for Literature.
PROCUNIER SAFETY CHUCK CO.
12 SO. CLINTON ST. CHICAGO, ILL.

Increase Your Machine Efficiency with
Automatic Lubrication
Blanchard Pulsolator Automatic Oil Lubrication Provides:
measured delivery of oil visible at each bearing when in motion.
increased production time and lowered oil and labor costs.
Write for descriptive bulletin B-5
RIVETT LATHE & GRINDER, INC.
BRIGHTON BOSTON, MASS.



QUALITY
BELT LACING

Clipper

BELT LACING
EQUIPMENT

The
WORLD'S
STANDARD
for
Twenty-five
Years

CLIPPER BELT LACER CO.
GRAND RAPIDS, MICHIGAN

QUALITY
BELT LACING

WHAT ARE THE VARIOUS COATED ABRASIVES? WHAT ARE THEIR USES?

By
E. B. GALLAHER
Editor, Clover Business Service
Treasurer, Clover Mfg. Co.

STRANGE HOW FEW MECHANICS REALIZE that there is a special type of Coated Abrasive made for every class of work. We are apt to call all wood-working abrasives "sandpaper" and all metal-working cloth "emery".

• The abrasives in use today are Flint, Garnet, Silicon Carbide, Aluminous Oxide and Emery—each best serves a special purpose.

• In this ad, and those which follow, we shall tell about each abrasive, describing their special uses—today we speak of "flint".

• FLINT SANDPAPER—The coating is crushed quartz, carefully graded into 11 grits. The backing is Kraft paper—the bond is glue.

• THE ORDINARY HARDWARE STOCK comprises 9" x 11" (standard) sheets, or the 8¾" x 10½" size, in grits from No. 4/0 to No. 3.

• FLINT FINISHING PAPERS are made in 9" x 11" sheets only, in grits from No. 5/0 to No. 2/0. Finishing papers are more flexible.

• FLINT SANDPAPER ROLLS, of 50 yards, are made in 8 standard widths, and in grits from No. 3/0 to No. 3.

• USES. Satisfactory for all ORDINARY sanding of wood and paint. The abrasive is relatively soft—not over-sharp. Generally used by house carpenters and painters; also for general household use.

• Flint Finishing Papers are employed for finer surfaces—working around mouldings, on furniture, etc., where flexibility and fine finish are necessary.

• Flint Paper Rolls are cut up and used with the lathe for sanding turned work.

• The 1" 50-yard Flint Roll is also employed by electrical workers for truing motor and generator armatures, armature brushes, etc.

• File these ads for reference.

NEXT ISSUE WE WILL DESCRIBE GARNET AND ITS VARIOUS USES.

CLOVER MFG. CO. NORWALK, CONN.
Also makers of the famous
Clover Grinding and Lapping Compounds

contacts the usual adjustable stop nut on the stop bar on the machine just as the chasers begin to form the thread.

At this point the forward travel of the operating ring is retarded while the die head itself continues to move forward to produce the thread. As the die head continues to move forward onto the work, this construction causes the chasers to open gradually, thus generating a tapered thread. When the cam shoe has traveled the full length of the cam on the operating ring, the die head automatically opens. Adjustment for thread length is obtained by properly setting the stop nut on the stop bar.

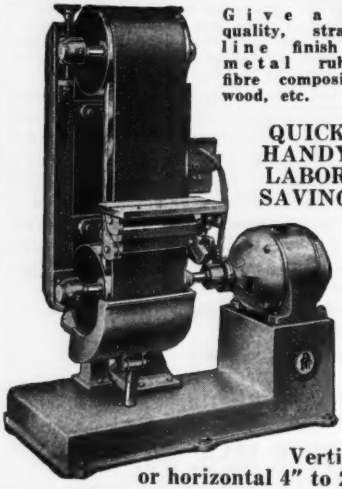
Since the forming and finishing of the thread is done by the first few teeth on the chasers, cutting strains are no greater than would be required for cutting a straight thread of corresponding diameter. Furthermore, the length of a tapered thread which can be cut is not limited to the width of the chasers, but is controlled only by the length of the cam travel. The result of this free cutting action is a better finish on the thread as well as a longer life for the chasers.

STAMPINGS . .

Small and medium from all sheet metals. Drawing to 5½ in. depth. Send samples or blue prints. High-grade work at interesting prices.

W. E. KAUTENBERG CO.
FREEPORT, ILL.

PEERLESS SURFACERS



Give a high quality, straight line finish to metal rubber, fibre composition wood, etc.

QUICK
HANDY
LABOR
SAVING

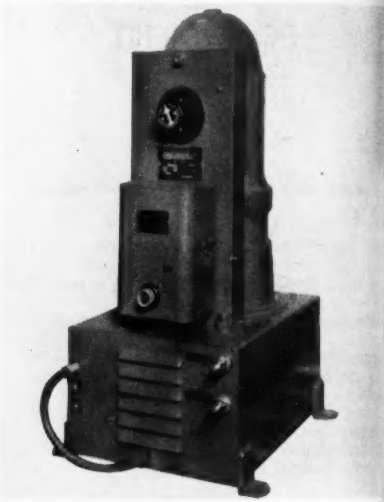
Vertical
or horizontal 4" to 20"

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

Lincoln 100-Ampere Welder

A new, small, low-priced motor generator type of arc welding machine is announced by The Lincoln Electric Company. This machine brings the many advantages of arc welding to sheet metal and fabricating shops, automobile repair shops, and others called upon to weld thin gauge materials.

Known as the SA-100, this new unit opens up an entirely new field of application for arc welding, since it delivers



Lincoln 100-ampere arc welder for use on light materials.

as low as 30 amperes at the arc without use of auxiliary devices.

The SA-100 is of motor-driven type with a current range of 30 to 12[illegible] amperes. The generator is of single operator variable voltage type with 10[illegible] ampere NEMA rating. Easy welding is assured by patented dual control which provides independent adjustment of open circuit voltage and welding current.

The motor is the Lincoln "Linc-Weld" 5 horsepower squirrel cage induction

CUT ANY SHAPE WITH HAIRLINE ACCURACY

Stanley Unishears offer the best, and most efficient method of cutting sheet materials on the job or in the shop.

Corners, angles, curves and notches are cut with hairline accuracy, leaving smooth edges, with no distortion of the material.

The Stanley "Mighty Midget" is easier to handle than a pair of snips. It is 100% safe and cuts fast—up to 15 feet per minute. Its capacity is No. 18 gauge (.050") hot rolled steel, other sheet materials in proportion.

Send for complete descriptive literature

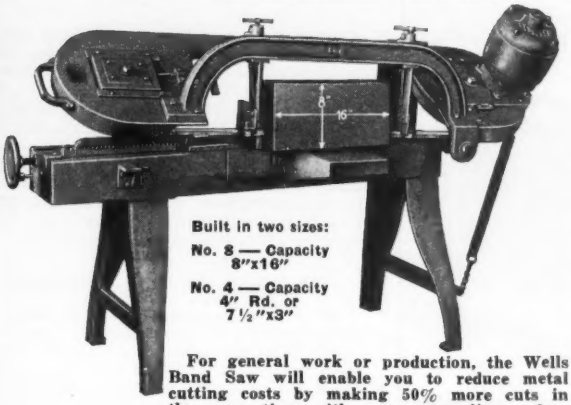
STANLEY ELECTRIC TOOL DIVISION
THE STANLEY WORKS
137 Elm St., New Britain, Conn.

STANLEY UNISHEARS

(The motor driven hand shears)

MODELS AVAILABLE WITH CAPACITIES UP TO ¼" BOILER PLATE

FOR LOW COST METAL CUTTING . . . . THE WELLS BAND SAW



Built in two sizes:
No. 8 — Capacity 8"x16"
No. 4 — Capacity 4" Rd. or 7½"x3"

- Low Price
- High Efficiency
- Continuous Cutting
- Accurate
- Will handle any metal
- No coolant required
- Long blade life

For general work or production, the Wells Band Saw will enable you to reduce metal cutting costs by making 50% more cuts in the same time with a corresponding reduction in labor cost per cut.

Send for folder.

THE WELLS MANUFACTURING CORP.

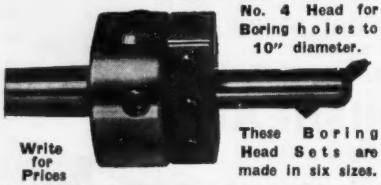
THREE RIVERS, MICH.

type for across-the-line starting. The starter switch is of push button type. Wing nut cable terminals permit easy change of welding current polarity. While normally built for 220 or 440 volts, the welder can be furnished for 110 or 550 volts, 3 or 2 phase, 60 and 50 cycles as desired. Connections are readily available for reconnecting from 220 to 440 volts, or vice versa.

The SA-100 is 20 inches long, 16 inches wide and 40 inches high. It requires less than 2¼ square feet of floor space.

Sheet metal shops and others that are called upon to weld thin gauge materials are enabled by the use of the SA-100 to produce in thin sheets, plates and shape the same high quality welds regularly obtained in heavier materials with the shielded arc process of welding. The current is uniform and of proper characteristics for using the smaller sizes of electrodes.

CRALEY OFF-SET BORING HEAD



No. 4 Head for Boring holes to 10" diameter.

Write for Prices

These Boring Head Sets are made in six sizes.

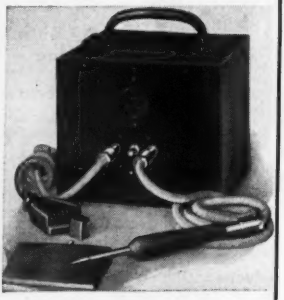
C. C. CRALEY MFG. CO., SHILLINGTON, PA.

MARK IRON, STEEL, ETC. with the Etchograph

NEW BABY GRAND MODEL

•

LOW PRICE



For all small work. Portable. Patented Elkonite tipped pencil for clear, deep marking and long life. Two other convenient sizes. Write for circular and prices.

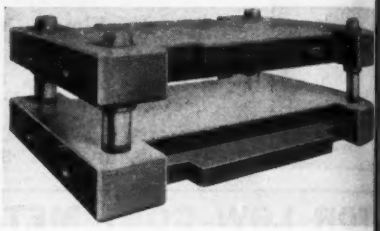
WM. BREWSTER CO.

40 CHURCH ST., NEW YORK, N. Y.

Danly Large-Size Standard Die Sets

To meet the needs of manufacturers who require larger standard die sets than those formerly available, Danly Machine Specialties, Inc., 2122 S. 52nd Ave., Chicago, Ill., has brought out a line of standard die sets especially designed for heavy work.

In the past, these large die sets have usually been made special as required. The Danly method of standardizing the special features provides the advantage



Danly "Large-Size" Standard Die Set

of special features in a standard design an extensive survey having been made to determine what could be considered as standard in a large die set. The types, sizes, and thickness combinations of the new "Large-Size" line are the result of this survey.

Sizes in the new line range from 10x10 inch to 46x100 inch. The possibilities as to combinations of features are practically unlimited, and the sets are available in either all steel or semi-steel.

Burni-Shave Gear Finisher

As a result of extensive research by the engineers of the National Tool Company, Madison and W. 112th St., Cleveland, Ohio, a process has been developed whereby the shaving operation on gears is combined with the burnishing operation, resulting in the production of practically noiseless precision gears. This result is achieved through the use of a gear finishing tool known as the "Burni-Shave", illustrated herewith.

The combination of the burnishing

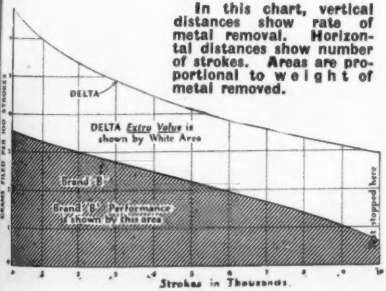
His Worth depends on the FILE!

Many tests have shown that Delta Files increase filing output by a wide margin. For average time and overhead, the saving even in one day is several times the price of the file.

The chart shows average performance of six Deltas and six files of another well-known brand, all 14-inch flat bastards, when tested 10,000 strokes each side in the Duplex Testing Machine under exactly equal conditions. Pressure, 30 lbs., relieved on back stroke. Test bars, 1x1 in. tool steel, Rockwell hardness C-34. Full records of this and many other tests furnished on request. Ask us or the Delta distributor in your territory.

DELTA FILE WORKS

BRIDESBURG PHILADELPHIA


In this chart, vertical distances show rate of metal removal. Horizontal distances show number of strokes. Areas are proportional to weight of metal removed.
DELTA
DELTA Extra Value is shown by White Area
Brand "B"
Brand "B" Performance shown by this area
Strokes in Thousands

ROSS Operating VALVES

"The Bridle for Air Horsepower"

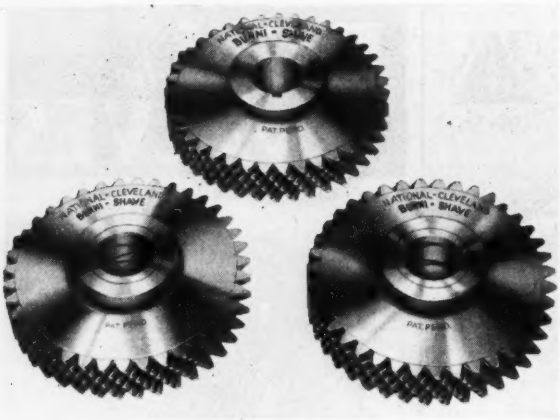
For Hand Control

Poppet type with renewable seats, and sealed by air pressure, assuring exceptional speed, easy control, coupled with safe operation over a long period of use.

All ports being on one face, Ross Operating Valves may be mounted on a plate to which the piping is attached, thus making the piping a permanent installation. To remove the valve merely loosen the bolts. Made for the control of single and double acting cylinders in all pipe sizes ranging from 3/8" to 1¼". Hand, foot or solenoid control.

There is a Ross Operating Valve for every air controlled operation in your plant. Write for catalog.

ROSS OPERATING VALVE CO.
6488 EPWORTH BLVD.
DETROIT MICHIGAN



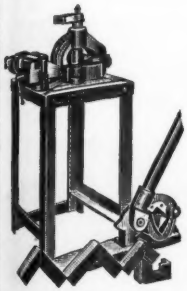
A Set Of Horizontal Burni-Shave Gears

with the shaving operation automatically eliminates one step in production, thus reducing the amount of equipment required with a corresponding reduction in maintenance. It is claimed by the manufacturer that tests have proved that gears can be produced by the Burni-Shave method almost to the extreme accuracy required in ground master gears. In some cases gears with 0.002 inch tooth misspacing and error in tooth form of more than 0.002 inch were corrected to a tolerance of less than 0.0002 inch.

The Burni-Shave gear finishing tool can be used on any gear tooth burnishing machine or it can be used with a fixture adapted to a milling machine. It thus obviates the necessity of installing expensive new gear finishing machinery. In actual production, the Burni-Shave has finished average sized gears in less than 15 seconds. This production yield, plus the reduction in spoiled work, is an important factor in production costs. The method is applicable to all types of gears: spur, spiral, internal, or external.

• GAMMONS •
HELICAL REAMERS
Spiral specialists
stocking reamers and end mills in all sizes and with various type shanks.
Let us quote on your special work.
THE GAMMONS-HOLMAN CO.
P. O. Box 187 Manchester, Conn.

Columbia
TOOL STEEL
OILDIE is the original time tested alloy oil hardening die steel.
With this non-deforming quality it offers the added value of high impact strength.
It pays to use Good Tool steel
COLUMBIA TOOL STEEL COMPANY
MAIN OFFICE AND WORKS
600 E. 14TH STREET CHICAGO HEIGHTS, ILLINOIS



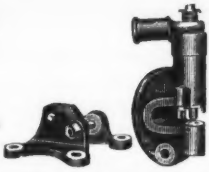
No. 455 Angle Iron Combination

Shears, Notches and Bends a 2" x 2" x ¼" angle iron in one minute flat.

Write for catalog on entire line.

No. 20 BALL BEARING PUNCH

Capacity ½" thru ½" iron



WHITNEY METAL TOOL CO.

110 Forbes St. Rockford, Ill.

A New Keyseater

With Tilting Table For Either Straight Or Tapered Bores

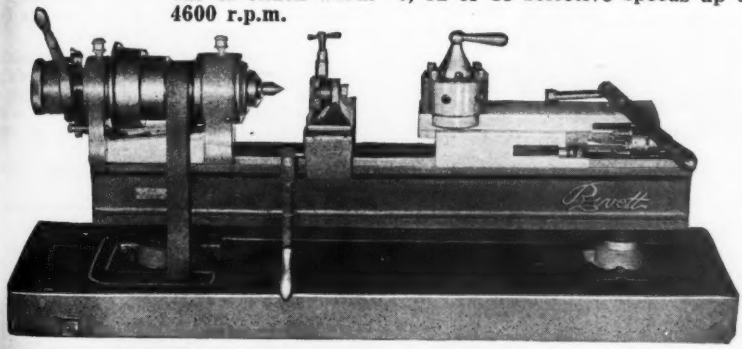
Send For Circular

Davis Keyseater Co.

Exchange and Glasgow Sts.
Rochester, N. Y.

RIVETT ANTI-FRICTION SPINDLE BENCH LATHES

are high production low cost machine tools for small bar or chuck work. 6, 12 or 18 selective speeds up to 4600 r.p.m.



Built with Timken Zero Precision roller bearing or Preloaded ball bearing heads. Collet capacity up to 1" diameter. Swing 8". Roller bearing lever chuck closer. Automatic six station turret. Cutting off and forming slide. Speed box drive with automatic brake. Oil pan.

Write for Bulletin 505-RB and price list.

RIVETT LATHE & GRINDER, INC. BRIGHTON, BOSTON, MASS.

"Hormel-M" Abrasive Hand Grinder

The illustration shows the "Hormel-M" Abrasive Hand Grinder, which has been added to the line of products of the Walls Sales Corporation, 96 Warren St., New York, N. Y. As shown, the grinder is motor-driven and is designed for bench use. The motor drives a pulley over which passes an abrasive belt. The belt is supported by a table which makes it possible to grind or polish flat surfaces of all sizes within the capacity of the machine.

Power is supplied by a ¼-h.p. 1750 r.p.m. Heavy Duty motor with an ext heavy ⅝-inch diameter shaft. A he of special design permits cool operati and yet prevents dust and dirt fro entering the motor sindings. Ball bea ings are used throughout. Non-slip pu leys 3½ x 4½ inches drive the abrasi

"Hormel-M" Abrasive Hand Grinder

belt over a 4½ x 9-inch table. The b is 4 x 36¼ inches in length. An ecce tric tension device control by means a lever makes possible quick changi of the abrasive belt, without the use tightening screws.

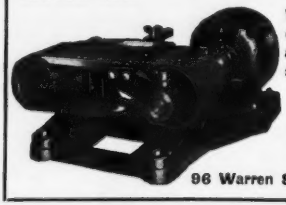
General Electric "Thrustor"

A number of improvements in t G-E Thrustor, a self-contained combi tion of motor-driven centrifugal pum oil chamber, and piston that produ a smooth straight-line thrust throu a definite length of stroke especia suitable for the operation of clutch brakes, valves, door, etc., have been a nounced by the General Electric Co pany, Schenectady, N. Y.

The new line of Thrustors consists a complete range of standard models p viding 10 combinations of thrust a stroke ratings varying from 50 to 3 pounds thrust and from 2 to 16 inc stroke.

In the new Thurstor, the impel

Soldering Aluminum
With Arrow Aluminum Solder
IS NOT DIFFICULT
Joints, breaks, shrinks, and cracks can be soldered, using an ordinary soldering iron or blow torch—without flux. Parts so soldered are practically fused together, making a permanent bond between the soldered parts. Arrow Aluminum Solder is the same color as aluminum and will retain the color after finishing or buffing.
SAMPLE BAR 25c
THE ARROW PRODUCTS CO.
P. O. Box 407 Birmingham, Ala.

SIMPLEX-M Abrasive Band Grinder
Eliminates hand finishing, speeds up production, and cuts costs.

Write for full details of this and other sizes.
WALLS SALES CORP.
96 Warren St., New York

5 H.P. 290 lbs.
VERTICAL ANGLE PLATE GRINDER
For Boring Mill or Planer, 2 H.P. to 10 H.P. Also for Lathe, Shaper, etc.
COMBINATION INTERNAL-EXTERNAL GRINDER
¼, ½, 1 H.P. Speeds up to 20,000 R.P.M.
Also Heavy Duty Grinders and Buffers up to 20 H.P.
Write for Complete Catalog
THE STANDARD ELECTRICAL TOOL CO.
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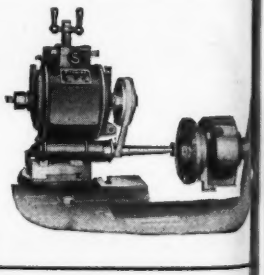

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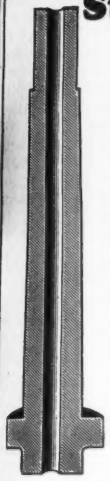

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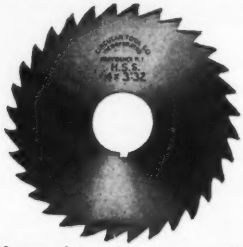

Years of experience in saw manufacturing PLUS modern, up-to-date manufacturing and hardening methods enables us to produce and recommend better saws for your problems. Circle "R" Saws are made in both high speed and carbon steel, from ¼" to 10" in diameter.

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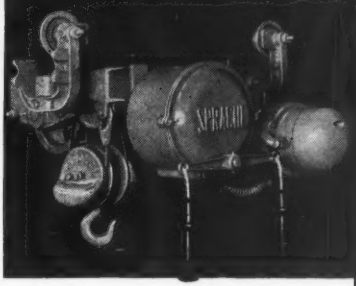
SPRAGUE ELECTRIC HOISTS



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CAPACITIES: ¼ TO 2 TONS

Features: **1.** Absolute minimum of headroom consistent with safe, durable construction. **2.** Direct worm drive. **3.** Few moving parts. **4.** Totally enclosed. **5.** Automatic Lubrication. **6.** Noiseless operation. **7.** Rope or push button control. **8.** Anti-friction bearings. **9.** Ball bearing trolleys with swivel yokes permit hoist to negotiate curves of small radius. **10.** Hoist frame supported by trolley yokes and not suspended from king pin.

SPRAGUE HOIST DIVISION

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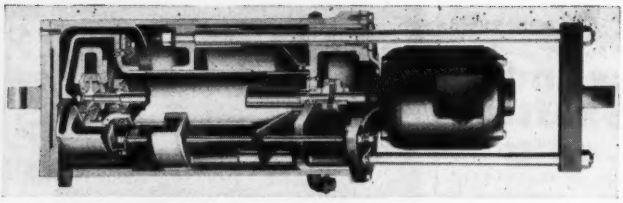

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able for clevis
rigid mounting
the device. Tilti
as much as 45
grees away fr
the vertical is pe
missible with
new Thrustors.
is also designed
continuous ope
tion with the p
ton in the stall
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As smooth ac
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housing of the centrifugal pump is stationary, a rigid shaft running in ball bearings connecting the impeller to the driving motor. A number of driving motor arrangements are available—ac. or dc. All motors are totally enclosed (except dc. and single-phase motors on the 50-pound size) for protection against dirt and moisture. For single-phase service, capacitor motors are used on all Thrustors rated 100 pounds and greater thrust. For 25-cycle service, a special step-up gear train is provided to obtain the same impeller speed as that produced in 60-cycle service. For 50-cycle supply, impellers of slightly greater diameter are used to maintain rated thrust capacity.

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Proceeding upon the premise that t
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that during soldering the solder di
solves from the aluminum, thereby pr
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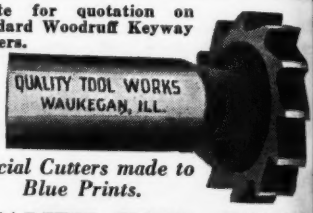

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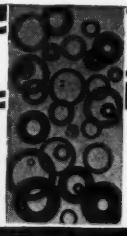

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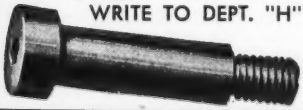

To help You pick the Right size TAP or DRILL

HEAVY CARDBOARD WALL CHARTS

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TAP & DRILL SELECTION TABLE

Here is a handy and useful guide which will help many tap users, produce better work, reduce spoilage, increase production.

Charts give recommended drill sizes—optional drill sizes to meet different requirements and methods of calculating drill sizes for special taps.

Send the Coupon for your Charts, with Our Compliments.

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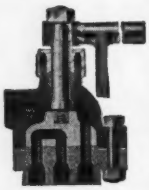

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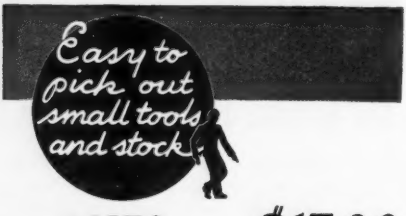

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$15.00

Measures ½-1000" more accurately, easier and quicker than old style micrometer.

1. One inch capacity
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3. Lock for use as snap gauge
4. Can be carried in pocket
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Fractional equivalents on back

B. C. AMES COMPANY
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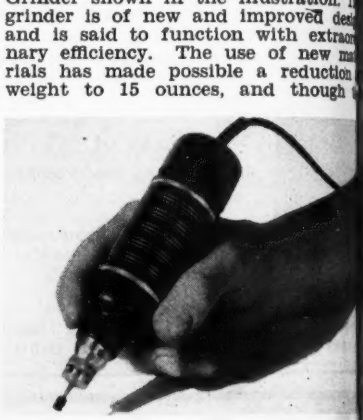
Ala., claims to have overcome this d
culty by producing an aluminum so
of lower melting temperature. The pr
uct of this firm is known as Ar
Aluminum Solder.

DeLuxe "Hand-ee" Grinder

To the line of "Hand-ee" Grind
made by the Chicago Wheel & Ma
Co., 1101 West Monroe St., Chicago,
has been added the DeLuxe "Hand-
Grinder shown in the illustration. T
grinder is of new and improved des
and is said to function with extraor
nary efficiency. The use of new ma
rials has made possible a reduction
weight to 15 ounces, and though



DeLuxe "Hand-ee" Grinder

tool has a speed of 25,000 r.p.m., it h
ample power to drive a wheel of 1¼ in
diameter or less.

The body of the tool is of Alumina
Duralumin, while moulded Bakel
parts are used as bearing retainers a
for end caps. The grinder is of u
usually small size, being 6 inches lo
overall and 1⅝ inches in diameter. T
housing is streamlined with no obstru
tions of any kind, this design bei
made possible through the use of a n
type of radial commutator and a
patented S-type built-in switch w
sliding contacts. Heat, so objectiona
in high speed electric tools, has be
entirely eliminated due to a radica
new type of fan mounting.

The motor is of Universal type, AC
DC, 25 to 60 cycles, 110-120 volts. Hi
speed precision ball bearings are use
grease-sealed with lubrication sufficie
to last the life of the bearings. T
armature is statically and dynamica
balanced, and is of special material wi
an in-built radial type commutat
Brushes are easily changed due to
finement of design and simplicity
construction.

A New "D & W" Chuck

Style S-7 x 17

A sturdy, dependable chuck, 3 9/16" high to meet demand for lower chuck than our standard F-7 x 16.

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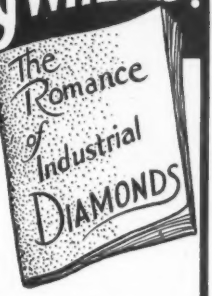
J. & H. ELECTRIC CO.
202 Richmond St., Providence, R. I.

WHAT SIZE DIAMONDS for your GRINDING WHEELS?

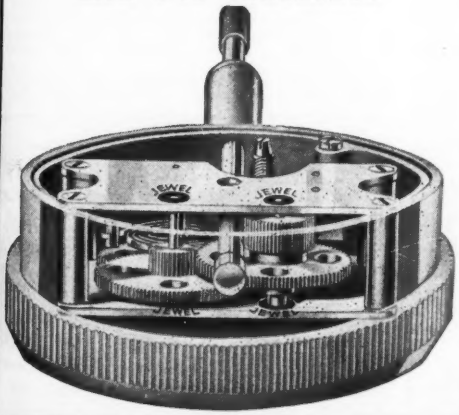
Send for



Discusses the History, Characteristics, and Classifications of Diamonds. A table is given as guide for selecting the correct size stones for all your grinding wheels.

ANTON SMIT & COMPANY
SELMA MERCANTILE CORP.
SOLE U.S. REPRESENTATIVES
24 STATE ST., NEW YORK, N.Y.

FEDERAL DIAL INDICATORS
Built Like Chronometers and As Accurate



Lasting accuracy is as necessary to the efficiency of a Dial Indicator as it is to a chronometer—and it is based on the same structural features.

We insure it in Federal Dial Indicators by JEWELED BEARINGS (though plain bearings are optional); DIE CAST CASE of bronze alloy composition with stem cast integral and no soldered joints; HOBBED GEARS and PINIONS—by the especially accurate Federal process; STAINLESS STEEL gears, pinions, screws, racks—non-corrosive and tougher than brass; INDIVIDUAL UNIT MOVEMENT (as in watches) reduces time for cleaning more than one half; all exposed parts CHROMIUM PLATED.

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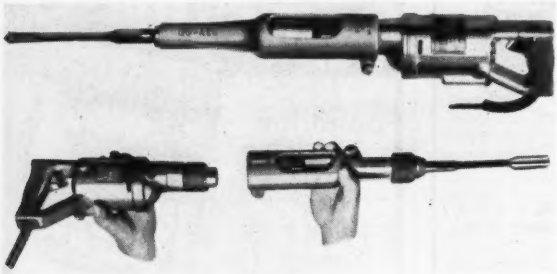
Wodack "Do-All"

A new idea in the construction of portable electric tools is said to be embodied in the Wodack "Do-All", which has been placed on the market by Wodack Tool Corporation, 4629 West Huron St., Chicago, Ill. The tool, which is shown in the illustration, is a combination electric hammer and drill. The hammer mechanism is so constructed that there are only two working parts, both of which are made of specially treated steel to insure long life.



Wodack "Do-All" Combination Electric Hammer and Drill

The motor is of the universal type with forced draft ventilation, and the tool may be operated from any light socket. By opening the chuck and loosening a capscrew, the hammer member may be removed and the tool used as an electric drill with a capacity of 1 inch in metal. It may also be used as a portable grinder and buffer.

When used as a hammer with star drills, the tool will drill holes in concrete and masonry up to 1⅜ inch diameter, and by using special tools it may be used for chipping, chiseling, cutting, and vibrating.

Ames No. 23 Dial Micrometer

A dial gage that offers great accuracy, easy reading, and simplified operation, to be known as the No. 23, has been brought out by the B. C. Ames Company, Waltham, Mass. Thin and compact, this model is of minimum size for a gage of ½-inch capacity, and is intended for vest pocket carrying.

A small hand on the dial face indi

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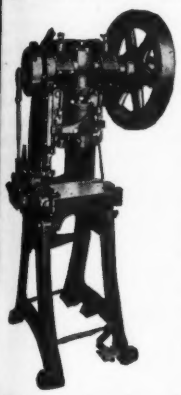

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This Feed has in addition to Littell's finest features, the unique characteristic of being mounted on its own bracket. You simply bolt it to your press bolster.

Write today for circular describing this amazing Style M Feed.

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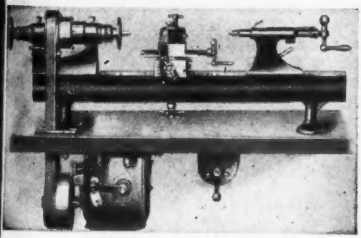

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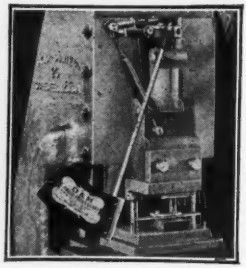

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It takes only one mistake on a punch press to cripple or lose a hand of an operator. Reduce the accident hazard by installing D & M Automatic Punch Press Guards. Dependable, economical, easy to install.

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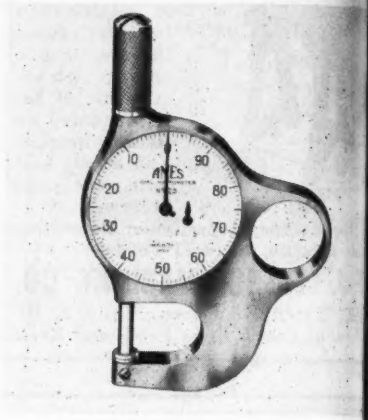
480 ST. PAUL ST. ROCHESTER, N. Y.

cates the number of large hand revolu tions. As on all Ames gages, the crysta is unbreakable. The knurled barrel r the top is revolved to operate the spi dle and to close or open the measurin anvils, and is easily operated by a slig finger motion of the hand holding th gage. A dial with fractions and dec mal equivalents is attached to the bac

The advantage of this gage consists the ease with which readings may



Ames Dial Micrometer No. 23

made. It saves time, prevents ey strain, and assures a high degree of a curacy. The mechanism is similar that of the No. 25 Thickness Measu and is said to be good for a lifetime service. Measuring capacity, ½ inc Approximate weight, 5 ounces.

B & S No. 12 Universal Millin Attachment and No. 12 H Vertical Milling Attachment

The Brown & Sharpe Mfg. Co., Prov dence, R. I., is announcing two new a ditions to their line of milling attac ments. The No. 12 Universal Millin Attachment is fully universal and d signed to be used for drilling, millin angular slots or surfaces, cutting rac etc., at the high speeds of modern mi ing machines. The spindle of the N 12 is driven by hardened bevel ge and has a B. & S. taper hole. An

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A Norgren Sight Feed Automatic Air Line Lubricator feeds oil to the tool **with the air that drives it.** Constant, automatic lubrication. Adjustable from zero to complete saturation of air stream. Shipped on trial to any rated concern. Write for specifications and prices.

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THIS valve is made in pipe sizes from ⅜ to 3" and is suitable for pressures from 10 lbs. to 1,000 lbs. Adjustment can be made by removing cap and turning adjustment screw at top of valve. The cylindrical piston seat closes off the port in a shearing manner, and does not seat abruptly against the body of the valve, thereby, relieving a pounding or chattering noise as ordinarily caused by standard valves using a disc seat.

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INC.
BLANCHESTER OHIO

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BROWN & SHARPE QUICK RELEASING END MILLS
for use with patented
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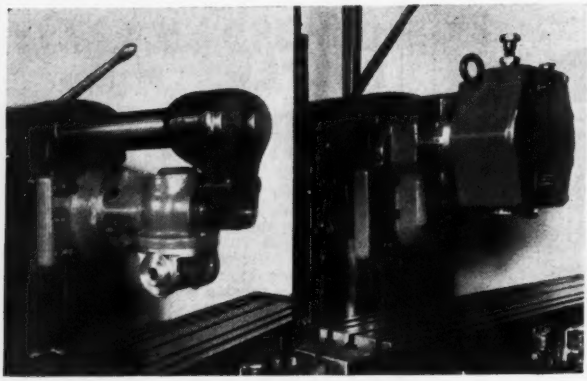
"Two Lipped"
"Spiral Two Lipped"



(Left)—Brown & Sharpe No. 12 Universal Milling Attachment
(Right)—Brown & Sharpe No. 12H Vertical Milling Attachment

friction bearings are used throughout and the attachment can be set at any angle in both vertical and horizontal planes. The position is indicated by graduations reading to half degrees.

The head is securely clamped at any desired setting and the attachment is

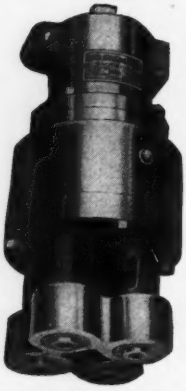
securely clamped t the face of the col umn and supporte at the outer end b the arbor yoke. A draw-in bolt is fur nished for holdin adapters, etc., in th spindle.

The ratio of the at tachment spindle t the machine spindl is 1½:1 and the at tachment is suitabl for speeds to 200 r.p.m. The attach ment is designed fo use on all styles o Brown & Sharpe Milling Machines o Nos. 1, 2 and 3 sizes Standard and High Speed.

The heavier clas of work performe on modern milling machines often re quires a vertical milling attachment with high spindle speeds. The No. 12H Vertical Milling Attachment is designed for this type of work. The spindle i driven by hardened steel bevel and spur gears and the drive is through anti-

4 Holes at Once

With a U. S. Multiple Drill Head



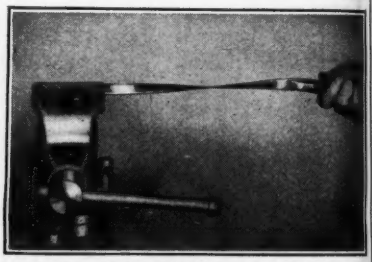
You can save money and time with U. S. Multiple Drill Heads, standard or special according to the job. This head is for drilling 4 holes at once . . . with other U. S. heads as many as 50 holes can be drilled at one time.

Send blueprints of your jobs and we will show you what you can save with U. S. Heads.

The United States Drill Head Co.

1954 Riverside Drive

CINCINNATI, OHIO



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ANGLE TOOL
for
WHEEL DRESSING

REDUCE GRINDING COSTS

FOLDER M ON REQUEST

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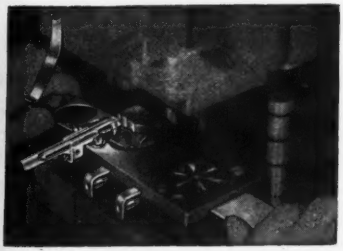
DIAMONDS AND DIAMOND TOOLS
505 Fifth Avenue, New York, N. Y.
Rep.: Milwaukee, Indianapolis, Cincinnati, Pittsburgh, Baltimore

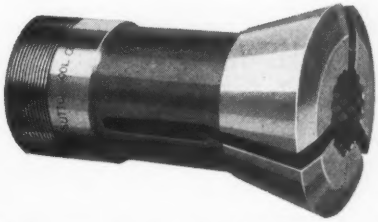


$1.00 will bring you this Automatic Stop . . . the most economical stop for blanking dies. SAVES 75% of your automatic stop cost. Can be fitted to any blanking die in 25 minutes. Conventional design . . . strong . . . simple. Send your order today.

Automatic Stop $1.00 each
Primary Stop $0.30 each
(Discount 15% on dozen lots)

R. KRASBERG & SONS MFG. CO.
1621 N. LINCOLN ST. CHICAGO, ILL.

SUR GRIP



Sutton Sur-Grip Collets
WITH DIAMOND SERRATIONS

ALL standard Sutton SUR-GRIP Collets, both solid and master-type, have diamond serrations. These clean-cut diamonds attack horizontal and rotating thrusts at an angle. They multiply gripping power many times and eliminate slippage. Catalog No. 11 lists SUR-GRIP Collets for all hand and automatic screw machines and shows full Sutton line of chucking accessories. Send for a copy.

SUTTON TOOL COMPANY
2840 W. Grand Blvd. Detroit, Mich.

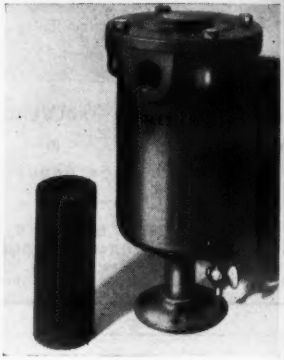
Sutton Master Collets
With SUR-GRIP Pads
Nothing Grips like a Diamond

friction bearings throughout. The spindle can be set at any angle from a vertical to a horizontal position. The position is indicated by graduations reading to half degrees.

A unique reservoir oiling system assures adequate lubrication of the mechanism for all positions of the swivel head. The spindle has a standardized end with a No. 50 Milling Machine Standard taper hole. A draw-in bolt is furnished. The ratio of the attachment spindle to the machine spindle is 1:1 and the attachment is suitable for speeds to 1300 R. P. M. The attachment fits all types of Brown & Sharpe Nos. 1, 2 and 3 sizes of machines, both Standard and High Speed.

Adams Air Filter

An air filter of unique design, specially designed to separate water, oil, and other foreign materials from compressed air has been brought out by the R. P. Adams Company, 220 Delaware Ave., Buffalo, N. Y. The filter comprises a combination of the centrifugal separator and a diffusion cell in which a high porous filter medium is used which re-



Adams Air Filter

tains its shape even though completely saturated. The air enters through an orifice located on the upper rim of the shell and circles around the inner rim at high velocity, during which the oil, water and other liquid entrainment is drawn into vertical slots by the centrifugal force.

As the velocity of the air decreases, it approaches the center axis and passes

GEARS IN STOCK Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue prints and inquiries.

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The Mummert-Dixon Spot Facer

. . . enables you to machine accurate and smooth surfaces on small bosses, etc., in less time than by any other method. Better investigate! Send for a bulletin.

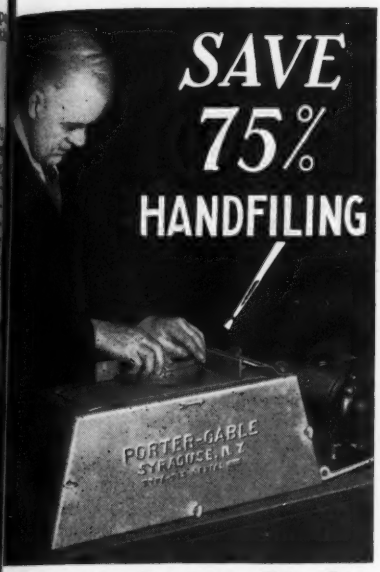
MUMMERT-DIXON CO. 120 Philadelphia St. HANOVER, PA.

FASTER . . .

Users say, on wheels where quick action is necessary you can't beat the Desmond-Huntington Dresser. It sharpens a dull or glazed wheel faster than any other method. Try it!

Write for Catalog M

THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO



REDUCE COSTS ON ALL LIGHT GRINDING WORK

Above is shown Porter-Cable Type B-12, 6" Belt Grinder for bench use, grinding face of bearing cap . . . only one of the hundreds of cost reducing uses for this sturdy, but inexpensive, grinder. Every machine shop and tool room should use this profitable grinding method.

"We reduced our hand filing more than 75% when your Belt Grinder was put on the job, and another 50% was saved on cost of files." Name on request.

PORTER - CABLE Belt Grinders are built in several models, one of which is certain to exactly suit your requirements. Illustration shows a practical operation on our **Type B-3, 10".**

Let us run a test on one or more of your ground parts and give you actual figures on these savings . . . or write for further details. No obligation, of course.

PORTER - CABLE MACH. CO.

300-6 WOLF ST., Metal Division, SYRACUSE, N. Y.

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TRADEMARK

Universal Joints

(PATENTED)

Apex Universal Joints are time tested — simple in construction and exceptionally strong. No projecting ears, pins or screws. Diameter from ½" to 4". Can be machined to meet any requirement. Approved for Aircraft use.

Apex Universal Joint Socket Wrenches

Apex Universal Joint Socket Wrenches for tightening nuts or cap screws in hard-to-get-at places are real time and money savers. Made in any size required for any electrical or air tool. Cannot over-travel their maximum working angle. Low first cost — long life — increased production.

For complete information write for copy of catalog No. 8.

THE APEX MACHINE & TOOL CO.

THIRD & MADISON STS., DAYTON, OHIO

THE NEW SHELDON 11" LATHE

● 11¼ in. Swing . . . Two bed lengths . . . 24 and 36 in. center distances . . . 1 1/16 in. Spindle Hole.

Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

Ask for Bulletin No. 23.

Sheldon Machine Co.

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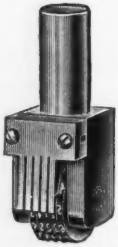
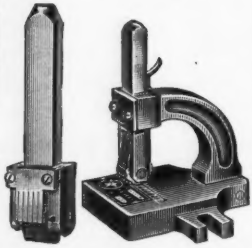
CHICAGO, ILLINOIS

Mark It Quickly with a NUMBERALL



Made with 1 to 8 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping. Platform for stamping Name Plates and other small articles.



We also make Steel Stamps, Trade Mark Stamps, etc.

Write for Circular and Prices.

Numberall Stamp & Tool Co.

Huguenot Park, Staten Island, N. Y.

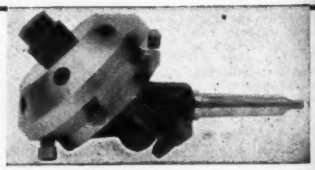
through the walls of the high poro filter stone molded in the shape of tube closed at one end. The open low end of this tube is mounted on a hollo pedestal, allowing the filtered air to pa downward and out the exit. The filte tube is a recent development and composed of aluminum oxide crysta mixed with a ceramic bond and molde into the tubular shape. It has a po osity of 38 per cent of its total volum It so thoroughly diffuses the air in pas ing through its porous structure tha oil or water comes into intimate con tact with the walls of the pore and absorbed up to the saturation point.

A spare filter tube is furnished wit each unit for replacement once in te days or two weeks. The removed ston is cleaned in any oil solvent and drie for the next replacement. The life o the filter tube is said to be infinite a the cleansing process restores its absorb ent properties.

No. 98 "Diamite" Wheel Dressing Tool

After several years of experimenting by the Research Laboratory of the Indus trial Diamond Co., 1342 West Vernor Highway, Detroit, Mich., in an effort t discover a bonding material for a dia mond-holding matrix that would mee a predetermined standard of quality, the grinding wheel dressing tool shown h the illustration has been developed.

The dressing tool, known as the No. 98 Diamite, is manufactured from a metallic substance, formed in the shape of a plug, in which are imbedded many layers of small natural diamonds, scien tifically spaced so that a number o sharp cutting points are simultaneously



Lathe Turret Head . . . $30.00

Especially adapted to lathe work . . . holds 6 various ½" shank tools at one loading, thereby replacing drill chucks. Saves its cost quickly. Write for descriptive circular.

TOM'S MACHINE COMPANY

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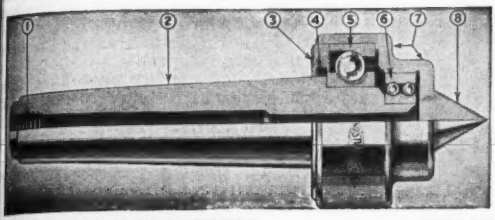

It turns with the work.
Eliminates friction of dead center.
Lowest possible overhang prevents vibration and chatter.

Write for Catalog and Free Trial Offer

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"EDGEMONT" SERVICE TESTED FRICTION CLUTCHES

DISC "TYPE SF"

A clutch suitable for the more severe service conditions of high speed, frequent operation, and heavy starting loads. If your present equipment is not satisfactory try the Edgemont Disc "Type SF" and know clutch satisfaction.

Complete list of sizes and styles sent on request.

The Edgemont Machine Co.

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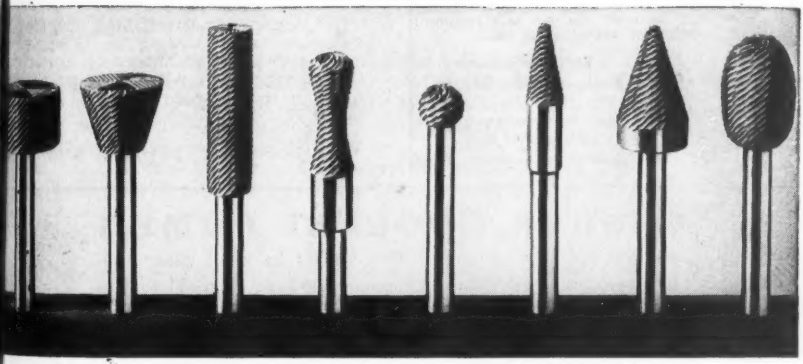
FORD HAND CUT ROTARY FILES



Just a few of the many standard shapes which are carried in stock.
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M. A. FORD MFG. CO.

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EISLER SPOT WELDERS
½ to 100 K. V. A.
ELECTRIC SAW BRAZING MACHINES, BUTT, WIRE, PORTABLE AND SPECIAL WELDERS
Welders as low as $35.00
Submit Samples for Test.
No Obligation.
Eisler Engineering Co.
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Dealers Wanted.
Write Chas. Eisler, Pres.

Saw Large and Deep **Holes**
MARVEL
High-Speed-Edge
Hole Saws
. . . Genuine 18% Cutting Edge on a Chrome - Vanadium Steel body—the long-lasting fast - cutting quality of High Speed Steel and the strength

for
Production Use on Drill Presses
Requiring far less power, size for size, than drills or boring tools, these strictly new type tools step up the capacity of small drill presses and portable tools — greatly reduce the costs of machine tool requirements for cutting large holes.
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"The Hack Saw People"
345 N. Francisco Ave.,
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in contact with the grinding wh
Each stone takes its proportionate b
den of the cut and individual cutt
points are maintained during the co
plete life of the dressing tool.

The tapered plug is brazed into a st
holder of size adaptable to all makes
grinders. The matrix metal in wh
the diamonds are held has the sa
coefficient of expansion as the diamon
thus the diamonds are retained fir
and permanently until the tool is worn out. No resetting is required, the matrix metal wearing away with the stones and making it possible for each diamond to render its maximum of cutting efficiency. No special holder is required; the tool is usually set at an angle of from 15 to 10 degrees from the horizontal point of contact.

The No. 98 Diamite T
is shown above toget
with a sectional vi
showing how the d
monds are impregn
in the tool.

"Marvel" Line of Horizontal, Fri tion-Type, Motor-Driven Tapping Machines

The Armstrong-Blum Mfg. Co., 347 Francisco Ave., Chicago, Ill., is announ ing a new line of "Marvel" horizonta friction-type, motor-driven tapping ma chines with a capacity range from fi thread No. 0 to ½-inch U. S. S. taps, steel.

The horizontal design is said to

GUSHER COOLANT PUMPS
- Compact Design enables installation in small space.
- Have Patented Features which are legally restricted to GUSHER PUMPS.
- Guaranteed Unconditionally for one full year.

These and many other features are discussed in our catalog. Write for a copy. No obligation.

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536 E. FRONT STREET CINCINNATI, OHIO

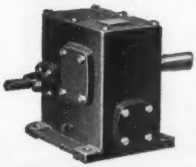
The Improved **OLIVER**

DIE MAKING MACHINE
With Its Many New Features

Will enable you to reduce the cost of labor on your dies, gages, cams, templates, stripper plates, experimental work, etc. from 30% to 60%. Send for our bulletin. No obligation.

OLIVER INSTRUMENT CO.
1430 E. Maumee Street, Adrian, Michigan

Ohio Speed Reducers



Made in 4 sizes. Complete ball and Timken bearing equipped. Hardened and ground worms. Bronze worm gears. Absolutely oil tight.

Write for prices and catalog.

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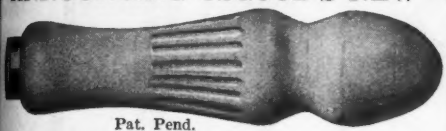
ANNOUNCING OSGOOD'S NEW "UNIVERSAL" HANDLE



Pat. Pend.

FOR FILES, SCREW DRIVERS, AND ALL TYPES OF HAND TOOLS.

Embodies new Balanced-Grip — never cramps — never slips. This Universal Combination Balanced-Grip Handle is provided with longitudinal grooves in combination with circular finger grooves affording a very powerful twisting motion for driving screws, nuts, taps, etc. with a socket wrench inserted, with very little effort. When used with a screw driver the finger in the circular groove holds the pressure forward when the hand is slipped back to give another twist, thus increasing the efficiency of the screw driver. 100% efficient. Works in close quarters.

"Super-Strong" Construction—Steel Lined
Write for descriptive circular. Send dime for sample, or quarter for sample handle and Safety FILEGRIP.

J. L. OSGOOD HANDLE CO.
43 PEARL ST. BUFFALO, N. Y.

GORHAM . . . .
Ground Tool Bits and Turning Tools . .

Now you can get GORHAM Ground Tool Bits and Turning Tools by the box from your local jobber. GORHAM Tool Bits are accurately ground and are expertly made by cutting tool specialists. They give more satisfactory results.

These Tool Bits are available in three distinctive cutting Materials . . . GORHAM Standard to cover the commercial field, GORHAM Imperial to cover the field of heavy cuts in hard material, and GORMET for the more abrasive materials.

Order from your dealer or write us direct for new circular giving prices.

GORHAM TOOL COMPANY
14400 Woodrow Wilson Ave.
Detroit, Michigan

SHORT RUN STAMPINGS
A process eliminating necessity of making expensive dies.
ALSO PRODUCTION STAMPINGS
We specialize in building mechanical devices. Write for estimates.

Established 1905
GERDING BROS.
5 E. THIRD ST. CINCINNATI, O.

Simplifies Assembly, Saves Time
Setting up a Bristo Set Screw is easy. Because of the gear-like action with which the Bristo Wrench meshes into the fluted socket, there is no fumbling, or bother or trouble, even in handling the smallest sizes. Once set, a Bristo stays set. It will not shake loose. Neither will the socket jam, round out or split. The Bristol Company, Waterbury, Conn., Branches in principal cities.

WHY THEY'RE BETTER
Compare direct turning pressure of Bristos (left) with sidewall pressure of other designs.
TRADE MARK
BRISTO
REG. U.S. PAT. OFF
SOCKET SET SCREWS
SOCKET HEAD CAP SCREWS

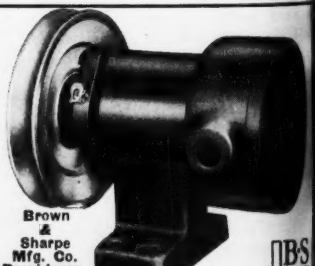
most universal for the widest range of work in both small and large parts. The machine is made in 7 different sizes and models, with 7 different capacity ratings and 7 different spindle speeds. All

Marvel Horizontal Friction-Type Tapping Machine

models are available in bench or floor type, and all are motor-driven.

Any of the 7 models is available in any of the following equipment combinations:

1. Bench or floor type, motor-driven.
2. Spring-return sliding table action only.
3. Rear lever action, with spring return.
4. Front lever action, with automatic depth trip and automatic reverse.

Compact -- Inexpensive
—for circulating oil for coolant or lubrication
—steady flow—runs either direction
—simple construction—dependable
Ask about the
BROWN & SHARPE No. 8 VANE PUMP

Brown & Sharpe Mfg. Co. Providence, R. I.

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FOR ECONOMY

All types for dressing grinding wheels. Shaped Diamond Tools, etc. Large stock unset stones on hand. Resetting and resharpenings returned same day received.

Send for price list and specify your requirements.

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Emery Wheel Dressers

CUTTERS
VARIOUS SIZES FOR YOUR WHEELS
Est. 1897—Write for Circular
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CENTERLESS GRINDING
Accuracy — Prompt Service
COMMERCIAL CENTERLESS GRINDING CO.
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Prefer Gerstner Tool Chests
No better, no finer, no more desirable Chests have ever been made. Write us if your dealer does not carry them. Free Catalog.

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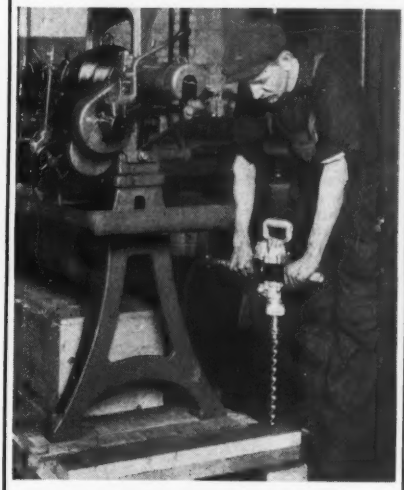

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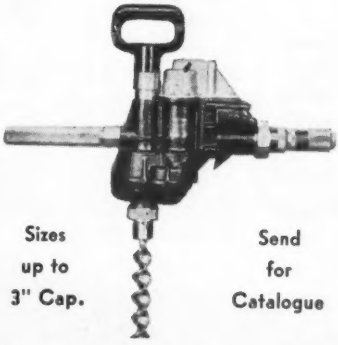
Watch the chips fly when a Rotor Woodborer is on the job

SPEED and POWER is the answer.



Sizes up to 3" Cap.

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Anderson Improved

Balancing Ways

No Leveling Required

A simple and excellent device for balancing straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four Chilled iron discs rotate on sensitive special bearings

Write for Full Information.

Mfg. By **Anderson Bros. Mfg. Co.**

1926 Kishwaukee St., Rockford, Ill.

Bench Model Marvel Tapper with Front Lever Action and Automatic Depth Trip

Bench Model Marvel Tapper with Spring - Sliding

5. Foot treadle action (on floor models only), with automatic depth trip and automatic reverse.
6. Quick-change spindles available for threading, tapping, nut or stud driving, etc.
7. Special two-tap geared spindle
ble for No. 0 to ¼-inch capacit
8. Any of the above equipment
added to any of the above
at any time.

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RIVETERS — PIONEERS in their line — Heads rivets smallest to ½" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature—and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
96 Silliman Avenue
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Monnier Electric Hoist

The electric hoist shown in the
tration has been placed on the
by Monnier Brothers, Inc., Alg
Mich. The design of the hoist i
to include a number of important
tures, the hoist being intended for
in machine shops, foundries, ship
rooms, or any other place where
of from 200 to 2000 pounds must
handled quickly and easily.

The hoist consists of 3 units:

PYRO THE IMPROVED SURFACE PYROMET

A Self-cohtained, Rugged, Quick-Acting, A
rate Precision Instrument for Curved or F
Stationary or Moving Surfaces.
Due to patented clamping-device embodied
indicator—A PYRO FEATURE—contact
reading of actual temperatures no longer
to be made simultaneously.
Extension handles to meet your requirem
Write for bulletin No. 60.
THE PYROMETER INSTRUMENT CO.
101-105 Lafayette St., New York

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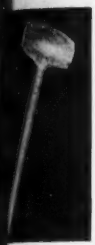
Small and Medium Sizes
Accuracy—Prompt Service
Hydraulic Operated
Broaches and Grinders
Aeroplane Parts

The Taylor Machine Co.
CLEVELAND, O., EST. 1907



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REPUBLIC LEAD EQUIPMENT COMPANY
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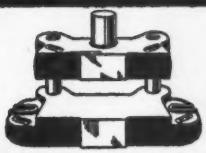
BAUMBACH



STANDARDIZED DIE SETS

SEMI-STEEL — DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, and a listing of more than 95,000 stock sizes, afford a service that is unsurpassed.

Send for Our New 208 Page Catalog

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MACHINED and CENTERED BRONZE BARS

BUNTING BARS are cast 13" long because 12" bar does not cut economically into standard bearing lengths. There are 121 stock sizes. Ask your dealer or write for list of Bronze Bearings carried in stock.

THE BUNTING BRASS & BRONZE COMPANY
Toledo, Ohio

Branches and Warehouses in All Principal Cities

BUNTING Quality

BRONZE BUSHINGS • BEARINGS
MACHINED AND CENTERED BRONZE BARS
ANTI-FRICTION METAL

139 STOCK UNITS

to select from in the Bond line of Speed Reducers

Sturdy, smooth-running units which meet the most exacting requirements. Timken Bearings. Write for booklet G-37.

CHARLES Bond COMPANY

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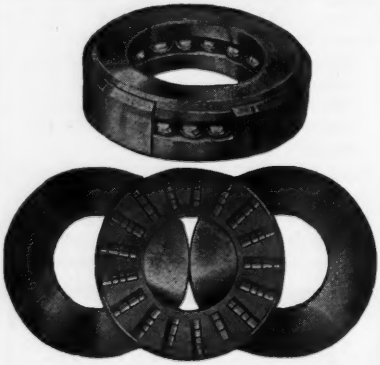

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ROLLER THRUST BEARINGS
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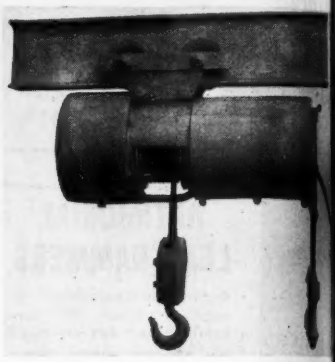
Special Bearings Made to Order.
Send Sketch or Sample for Quotation.

Catalog Upon Request

THE GWILLIAM CO.
358 Furman St., Brooklyn, N. Y.

and control, lifting unit which con
of the winding drum yoke and c
and the gear box and gears. The m
is of standard make. The control l
which operates the motor switch
controls the brake so that when



Monnier Electric Hoist

power is turned on, the brake is rel
and vice versa.

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which is adjustable to different w
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be used by removing the trolley
using adapters. All gears in the h
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housed in an oil-tight, dust-proof h
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ing from 28 feet for the small size
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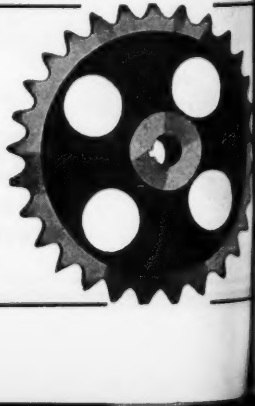

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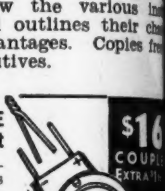

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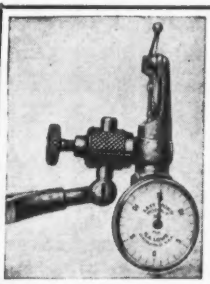

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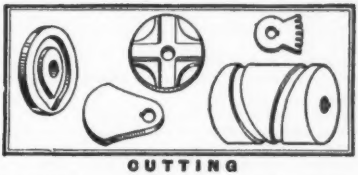

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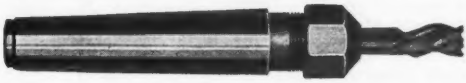

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